

REVISION OF THE DIOECIOUS AMARANTHS¹

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In the great genus *Amaranthus*², the relatively small number of dioecious species, including those formerly assigned to other genera which are here united with *Amaranthus*, form a fairly distinct and coherent group. In contrast to the monoecious amaranths, which are represented by endemic and pandemic species in every continent, all the dioecious amaranths are natives of a single continent, North America, and none has migrated very far from its original home. An endemic Peruvian species (*A. Haughtii* Standl. Field Mus. Bot. Ser. 11:149. 1936) is described as dioecious, but examination of the type and all other available collections shows it is actually monoecious.

The dioecious habit, which is extremely constant, is the only morphological character distinguishing this group as a whole from all the monoecious amaranths. However, all the dioecious species share a combination of characters which occurs in only a small minority of the monoecious species, namely pentamerous staminate flowers together with complex terminal inflorescences, often called spikes in the literature but technically thyrses. It is conceivable, although by no means certain, that the group is a natural one, in the sense of having a single origin with subsequent speciation independent of the rest of the genus. Be that as it may, no formal section or sections for the dioecious species are proposed here. Considering the lack of any widely accepted subdivisions of other parts of the genus, formal infra-generic disposition of the dioecious species does not appear urgent or useful at the present time.

Hybridization is given little attention in this paper, although it is a common and widespread source of variation in the group. In fact it was natural "intergeneric" *Amaranthus* × *Acnida* hybrids that first attracted my attention to this group; the revision was initiated primarily because clearer understanding of the species involved was prerequisite to understanding of the hybrids. The study of individual variants in the mongrel populations, which is still in progress, is being handled as a separate problem. The present paper has the limited objective of characterizing the basic entities in the group.

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² The English text of the International Code of Botanical Nomenclature (Lanjouw et al., 1952, p. 44) states that *Amarantus* is the original spelling, in contradiction to the French text (p. 193) and the facts. In the same volume (p. 101), *Amarantus* is proposed for conservation over *Amaranthus*, while Amaranthaceae (with *Amaranthus* as the type genus) is included in the *nomina familiarum conservanda* (p. 66).

SYSTEMATIC CHANGES

The taxonomic treatment presented here differs considerably from Standley's (1917), the only other modern treatment of the group. There are ten species in place of Standley's sixteen and all are now assigned to *Amaranthus*, rather than being divided among three genera: *Amaranthus*, *Acnida*, and *Acanthochiton*. Discussions of the revised species definitions are given below in the sections on individual species, but some explanation should now be made of the revised generic grouping.

Acanthochiton is a monotypic taxon that was originally described (Torrey, 1853, p. 170) under the curious belief that it was a new genus of the Chenopodiaceae, where it could hardly have been included in any other genus. Torrey himself suggested that it might better be assigned to the Amaranthaceae, where later workers have invariably placed it. The peculiar bracts provide the one clear-cut character distinguishing this taxon from *Amaranthus*. This difference, although conspicuous, is only quantitative and seems no more fundamental than the modification of bracts to spines in the monoecious *Amaranthus spinosus*, for which a separate genus has never been found necessary. Moreover, the peculiar bracts develop only on the pistillate plants, while the staminate plants are within the range of variation of *Amaranthus* species in all morphological characters. The affinity of *Acanthochiton* to certain species of *Amaranthus* is so obvious that I believe it has been left as a distinct genus only because the plants are rather rare and have attracted little attention. Addition of this taxon to *Amaranthus* requires no change in the usual definition of the genus.

Acnida, like *Amaranthus*, appeared in Linnaeus' "Species Plantarum" of 1753 long before most of the North American amaranth species were discovered. *Acnida* originally included a single species, *A. cannabina*, which differed from all of Linnaeus' *Amaranthus* species not only in various quantitative characters but also in two clear-cut qualitative characters: dioecious habit and pistillate flowers with no perianth. Subsequently, as more and more species became known, this discontinuity gradually blurred. Separation of the genera on the basis of dioecious or monoecious habit was abandoned when new dioecious species were discovered and assigned to *Amaranthus* because of the conspicuous perianths of their pistillate flowers. Absence of this perianth has become the sole criterion for separating *Acnida* from *Amaranthus*; no comparable key character was applicable to the staminate plants. This single remaining criterion is largely a fiction: the presence of a pistillate perianth in certain *Acnida* species was reported nearly sixty years ago (Uline and Bray, 1895, p. 156) but the fact has generally been ignored or glossed over in later literature. Pistillate tepals are truly absent in some species assigned to *Acnida*; in some they are very small and irregularly present, so that they might be dismissed as mere rudiments, but in other species they are well-developed and constantly present. Although this perianth may consist of

only one or two tepals, the same is true of some monoecious *Amaranthus* species. In short the two "genera" can be separated only by using intricate character combinations rather than by a clear-cut dichotomy. Moreover, they are not easy to distinguish subjectively on the basis of general aspect.

The absence of a clear-cut morphological discontinuity is accompanied by the absence of an absolute reproductive barrier. The existence of natural *Acnida* \times *Amaranthus* hybrids has already been mentioned. This evidence is reinforced by a magnificent series of experimental crosses between certain species of *Acnida* and *Amaranthus* (Murray, 1940). These hybrids are highly sterile, but no more so than some of Murray's crosses between two species of *Amaranthus*.

The balance of the evidence seems to show that the affinity between *Acnida* and *Amaranthus* is too great to justify maintaining them as separate genera, and the two are here united. Although neither name has priority, *Amaranthus* has had far more general currency and is the obvious choice for the enlarged group. This union requires that *Amaranthus* be described as having 0 to 5 tepals in the pistillate flowers, rather than 1 to 5 as formerly. Otherwise no change is required in the usual circumscription of the group.

NOTES ON MAPS AND CITATIONS

All specimens cited and mapped have been assigned to species primarily on the basis of microscopic flower characters. The great majority of specimens show the constantly repeating morphological patterns characteristic of pure species; these specimens were annotated with the usual type of label and the localities were plotted on the maps as dots. A respectable minority of the specimens are individual variants, presumably the result of crossing between dioecious species. As is so often the case in hybrid populations found in nature, exact intermediates between the two parental species are rare; an individual usually has a preponderance of traits of one or the other species. These atypical plants were assigned to the species which they resemble most closely, annotated with special labels indicating their probable hybrid origin, and plotted on the maps with crosses. In cases where both typical and atypical specimens are known from the same locality the cross symbol is omitted, so that the total occurrence of atypical plants is somewhat greater than the maps indicate. No attempt is made to separate typical and atypical specimens in the citations since both are commonly included in a single collection.

A certain class of dioecious specimens has been annotated but excluded from maps and citations. These are highly sterile plants, probably mostly F₁ hybrids between monoecious and dioecious species, which cannot properly be assigned to any one species.

In the citations, names printed in upper case under each country refer to civil divisions of two ranks: the state, province, or department at the start of each paragraph, followed by subdivisions such as county, parish, or *municipio*. An asterisk preceding the name of a country or division

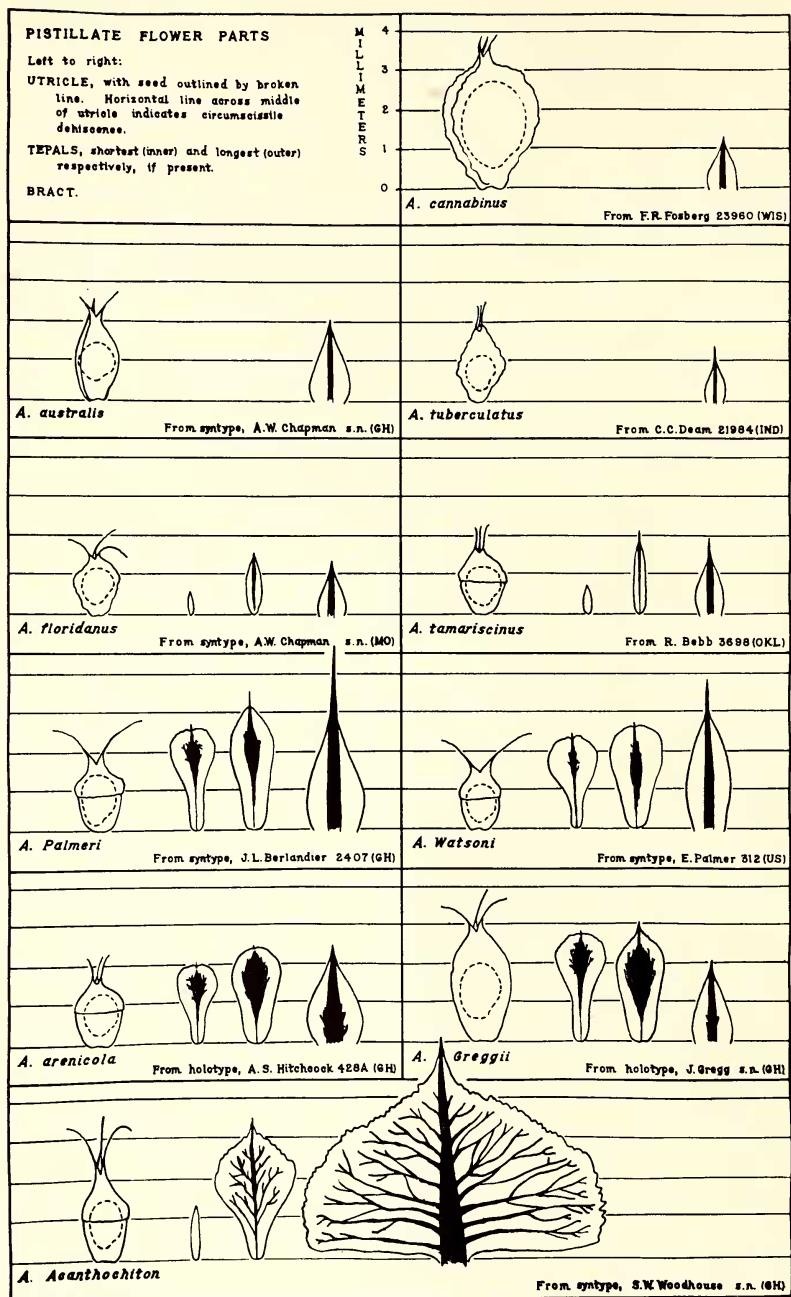


FIG. 1. Pistillate flower parts of the ten dioecious species of *Amaranthus*.

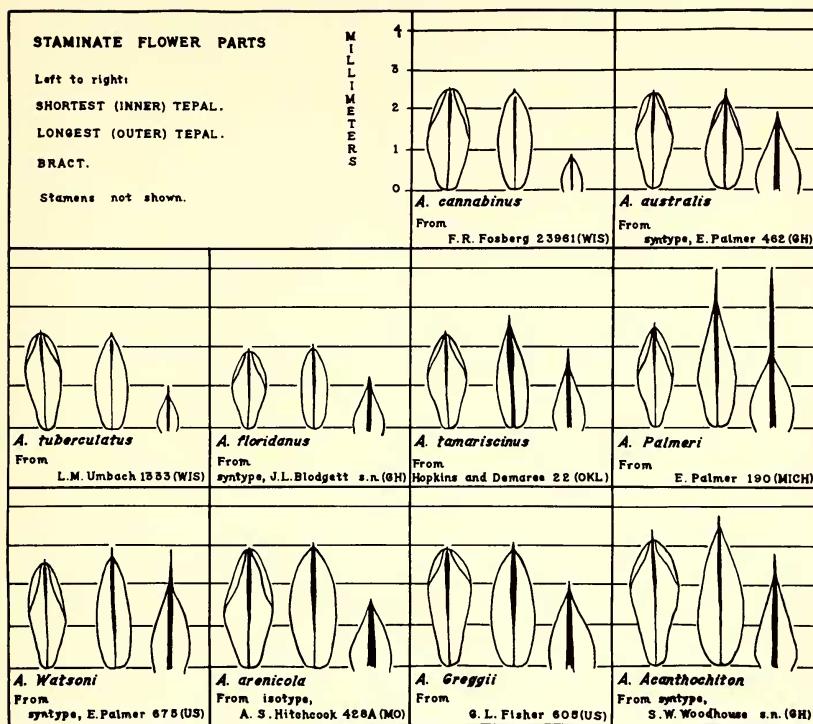


FIG. 2. Staminate flower parts of the ten dioecious species of *Amaranthus*.

indicates that it is outside the area covered by the map. The year given in parentheses after each major civil division name is the collection date of the oldest specimen seen from the region. Collections are listed only by collector, number (if given), and herbaria, abbreviated according to the scheme of Lanjouw and Stafleu (1954).

Collections from the herbaria at the following institutions are cited: California Academy of Sciences, Carnegie Museum, Cornell University, Duke University, Gray Herbarium of Harvard University, Herbier Marie-Victorin de l'Université de Montréal, Indiana University, Iowa State College, Kansas State College, Michigan State College, Missouri Botanical Garden, Museum of Northern Arizona at Flagstaff (cited as FLAG), New Mexico College of Agriculture and Mechanic Arts, North Dakota Agricultural College, Oberlin College, Ohio State University, Pomona College, Rocky Mountain Herbarium of the University of Wyoming, Smithsonian Institution, South Dakota State College, Southern Methodist University, State University of Iowa, Sul Ross State College, Tulane University, University of Arizona, University of Arkansas, University of California at Berkeley, University of Cincinnati, University of Colorado, University of Florida Agricultural Experiment Station, University of Illinois, University of Michigan, University of Minnesota, University of Nebraska, Univer-

sity of North Carolina, University of Oklahoma, University of Tennessee, University of Texas, University of Wisconsin, Utah State Agricultural College, West Virginia University.

KEYS TO THE SPECIES

The key to pistillate plants is the more reliable one, since most of the diagnostic characters are concentrated in the mature pistillate flowers. Flowering staminate plants can be identified with reasonable accuracy but recognition depends in part on familiarity with slight differences in aspect which cannot be adequately described in a key. In dealing with any of these plants it must be remembered that the frequency of hybridization in the group makes identifications based solely on a key even less trustworthy than usual.

PISTILLATE PLANTS

- A. Lamina of bract narrow, entire, scarious, not enfolding flower; leaf margin smooth.
- B. Tepals completely lacking or irregularly present and rudimentary (less than 1 mm. long and without visible midveins).
 - C. Seed 2 to 3 mm. long; utricle 2½ to 4 mm. long; leaf-blade usually narrowly lanceolate to linear 1. *A. cannabinus*
 - CC. Seed about 1 mm. long; utricle not exceeding 2 mm. in length; leaf-blade usually broadly lanceolate.
 - D. Utricle with conspicuous, regular longitudinal ridges; bract more than 1½ mm. long with stout midrib not far excurrent beyond lamina.
 - DD. Utricle smooth or irregularly tuberculate; bract less than 1½ mm. long with slender excurrent midrib 3. *A. tuberculatus*
 - BB. Tepals regularly present and well developed (at least 1 mm. long and with distinct midveins).
 - C. Tepals 1 or 2, lanceolate to linear.
 - D. Utricle indehiscent; leaf-blade usually linear 4. *A. floridanus*
 - DD. Utricle circumscissile; leaf-blade usually oblong or lanceolate 5. *A. tamariscinus*
 - CC. Tepals 5, at least the inner ones spatulate.
 - D. Utricle circumscissile, about 1½ mm. long; leaf-blade membranaceous.
 - E. Longest (outer) tepal acute or acuminate with midvein excurrent into rigid point; bract and outer tepals conspicuously longer than inner tepals 6. *A. Palmeri*
 - EE. Tepals all obtuse or retuse, the midveins excurrent slightly or not at all; bract and outer tepals scarcely exceeding inner tepals.
 - F. Bract with moderately heavy midrib, excurrent far beyond lamina; style branches usually 2 7. *A. Watsonii*
 - FF. Bract with extremely heavy midrib, not excurrent far beyond lamina; style branches usually 3 8. *A. arenicola*
 - DD. Utricle indehiscent, about 3 mm. long; leaf-blade coriaceous.
 - 9. *A. Greggii*
 - AA. Lamina of bract extremely broad, crenate, foliaceous, enfolding and concealing flower; leaf margin crispatate 10. *A. Acanthochiton*

STAMINATE PLANTS

- A. Outer tepals without heavy midveins and not appreciably longer than the inner; bracts mostly with slender midribs, not over 2 mm. long.
- B. Bract less than 1 mm. long, the midrib scarcely excurrent. 1. *A. cannabinus*

- BB. Bract more than 1 mm. long or, if slightly shorter, the midrib conspicuously excurrent.
 - C. Leaf-blade usually lanceolate, more than 1 cm. wide; inflorescence often with several branch thyrses not subtended by leaves.
 - D. Bract with moderately heavy midrib; outer tepals with excurrent midveins 2. *A. australis*
 - DD. Bract with slender midrib; midveins of outer tepals not excurrent 3. *A. tuberculatus*
 - CC. Leaf-blade usually linear, less than 1 cm. wide; inflorescence unbranched above leaves 4. *A. floridanus*
- AA. Outer tepals with heavy midveins, often definitely longer than the inner; bracts with heavy midribs, mostly over 2 mm. long.
- B. Outer tepals acuminate, the midveins excurrent as rigid spines.
 - C. Bract about 2 mm. long, definitely shorter than outer tepals 5. *A. tamariscinus*
 - CC. Bract about 4 mm. long, usually equalling outer tepals 6. *A. Palmeri*
 - BB. Outer tepals acute or obtuse, apiculate, but the dark midveins not excurrent.
 - C. Bract equalling tepals, often conspicuously pubescent 7. *A. Watsoni*
 - CC. Bract shorter than tepals, glabrous.
 - D. Leaf margin smooth.
 - E. Leaf-blade membranaceous 8. *A. arenicola*
 - EE. Leaf-blade coriaceous 9. *A. Greggii*
 - DD. Leaf margin crispatate 10. *A. Acanthochiton*

1. ***Amaranthus cannabinus* (L.) comb. nov.** *Acnida cannabina* L. Sp. Pl. 2:1027. 1753. *A. rusocarpa* Michx. Fl. Bor. Am. 2:234. 1803. *A. rusocarpa* Willd. Sp. Pl. 4:768. 1805. *Amaranthus macrocaulos* Poir. in Lam. Encyc. Suppl. 1:314. 1810. *Acnida salicifolia* Raf. Am. Mo. Mag. 2:43. 1817. *A. rhyssocarpa* Spreng. Syst. 3:903. 1826. *A. obtusifolia* Raf. New Fl. 1:54. 1836. *A. Elliotti* Raf. loc. cit. 54. 1836. *A. cannabina* L. [var.] *a lanceolata* Moq. in DC. Prodr. 13(2):277. 1849. *A. cannabina* L. [var.] *γ salicifolia* (Raf.) Moq. loc. cit. 278. 1849.

The Linnaean species was based on an older taxon (*Cannabis foliis simplicibus* Gronov. Fl. Virg. 192. 1739. Type: *J. Clayton* no. 599, Virginia, salt marshes, abundant in August). The description and place of collection make its identity reasonably certain. Michaux distinguished his species from that of Linnaeus by slight differences in leaf and utricle shape; he specified no type or locality but published a recognizable drawing of the plant. During the nineteenth century various authors attempted to maintain a distinction between *Acnida cannabina* and *A. rusocarpa* (the latter often being given one of the "corrected" spellings suggested by Willdenow and Sprengel). This attempt was finally abandoned after Uline and Bray (1895, p. 155) pointed out, correctly I believe, that "*A. cannabina* and *A. rusocarpa* are not distinct. We find here a complete series of intergradations, while the difference of age actually accounts for more than the difference called for in their original descriptions." *Amaranthus macrocaulos* was first published with a completely inadequate description, but Moquin-Tandon re-examined the type (*J. Bosc* s.n., Carolina), citing Poiret's species as a synonym of his own variety *lanceolata*, based on the same specimen. From Moquin-Tandon's description and the place of collection, it is fairly certain that Bosc's specimen should be assigned to *A.*

cannabinus, although the material may represent one of the southern colonies which show traces of introgression from *A. australis*. *Acnida salicifolia* was described from plants growing on the seashore and in marshes and ditches in Long Island and New Jersey; no specimens are cited. The localities, together with Rafinesque's statement that the species is intermediate between *A. cannabina* and *A. rusocarpa*, indicate that he was dealing with plants which were at the most minor variants of *Amaranthus cannabinus*. Rafinesque presented *Acnida obtusifolia* as a substitute name for the taxon which everyone had been calling *A. cannabina*, stating that Linnaeus had described that species as having compound leaves and was therefore dealing with an entirely different plant. This curious idea has no known basis; Linnaeus' original description specifically stated that the species has simple leaves. *Acnida Elliotti* was described as growing on the banks of streams in Carolina and Florida. No specimens are cited, but the locations and the incomplete description suggest that this name, like *Amaranthus macrocaulos* was called forth by contact with some of the atypical plants which occur toward the southern margin of the range of *A. cannabinus*.

Plants stout, erect, usually 1 to 3 m. tall with ascending branches; leaf-blade narrowly lanceolate to linear, faintly resembling a willow or hemp leaf (whence some of the scientific names and the common name of "water-hemp"), flowering and fruiting entirely during summer and fall, mainly July to late October; thyrses flexible, usually 5 to 10 cm. long, the glomerules often few-flowered and widely-spaced, in the ♂ plants leafless branch thyrses often numerous and the uppermost ones often not subtended by leaves, the ♀ thyrses either entirely terminal on leafy branches or, if a few branch thyrses present, each subtended by a leaf; bract with midrib scarcely excurrent, the ♂ bract about 1 mm. long, midrib very slender, the ♀ bract about 1½ mm. long, midrib moderately heavy; ♂ flowers with 5 stamens, the 5 tepals approximately equal, 2½ to 3 mm. long, the inner emarginate, the outer acute, the midveins not excurrent; ♀ flowers usually without perianth, rarely with 1 or 2 irregular, rudimentary tepals; utricle 2½ to 4 mm. long, indehiscent, fleshy, with 3 to 5 prominent longitudinal ridges corresponding to the 3 to 5 style branches, often rugose and black when mature; seed 2 to 3 mm. in diameter, often obovoid, flattened with depressed endosperm, dark reddish brown.

The species is almost entirely confined to the margin of tidewater in a zone where the surface is covered by salty, brackish, or fresh water at high tide. Almost every collection bears some such notation as: coastal marsh, brackish marsh, salt marsh, salt meadow, tide flats, edge of slough, bank of estuary, tidal riverbank. The plants are most common in sandy places but are also reported in mud and muck. A collection from a millpond in Delaware was the only one seen from an inland site. If the species has weedy tendencies, they are slight; there is one collection from wet, peaty clearings in the pinewoods along the Virginia coast and another from a railroad yard by the tidal Delaware River at Camden.

UNITED STATES. CONNECTICUT (1859). FAIRFIELD: *E. R. Drew* KSC, MO, UC; *E. H. Eames* GH, ILL, MIN, US, WIS. MIDDLESEX: *Anonymous* GH, MO; *H. L. Jones* OC. NEW HAVEN: *E. H. Eames* ILL; *D. C. Eaton* WIS; *G. R. Kleeberger* CAS; *A. B. Seymour* DUKE; *R. H. Ward* ILL. NEW LONDON: *K. P. Jansson* COLO, MT, RM; *W. A. Setchell* UC.

DELAWARE (1861). KENT: *N. Hotchkiss* 4765, US; *E. L. Larsen* 711, DUKE, GH, US, WIS, 734 GH, 762 MO, US, 770 MO. NEWCASTLE: *W. M. Canby* POM, WIS; *J. R. Churchill* GH, MO, WIS; *E. L. Larsen* 665 MO; *I. Tidestrom* 11529 GH.

DISTRICT OF COLUMBIA (1877). *F. Blanchard* MO, WIS; *E. S. Steele* MIN, NEB, OC, WIS; *G. Vasey* MSC; *L. F. Ward* GH, MO, NEB, US.

FLORIDA (1880). Indefinite locality: *W. W. Calkins* ILL; *A. H. Curtiss* NCU. DUVAL: *A. H. Curtiss* 2379 CM, CU, FLAS, GH, MIN, NEB, US, 5117 ILL, MO, US.

GEORGIA (1902). CAMDEN: *R. M. Harper* 1556 GH, MO, MSC, NEB, US; *Wiegand & Manning* 1131 CU, GH. MCINTOSH: *Thorne & Norris* 6231 CU.

MAINE (1916): CUMBERLAND: *Fernald, Long, & Norton* 13581 GH, MT. YORK: *A. E. Perkins* GH; *R. H. True* 1086 MIN.

MARYLAND (1887). ANNE ARUNDEL: *H. H. Bartlett* 1837 MICH; *W. C. Muenscher* 3711 CU, 3712 CU; *J. W. Roller* 754 TENN; *J. Schneck* ILL. CALVERT: *A. S. Hitchcock* ILL. CECIL: *W. M. Benner* 6165 GH. CHARLES: *H. O'Neill* MT. PRINCE GEORGES: *F. Blanchard* MO. SAINT MARY'S: *J. E. Benedict, Jr.* UARK; *E. P. Killip* 32194 MICH, POM, UC. TALBOT: *E. C. Earle* 1283 WVA, 2265 CU; *F. Shreve* 176 ARIZ.

MASSACHUSETTS (1856). BARNSTABLE: *J. M. Fogg, Jr.* 3706 CU, MO; *C. H. Knowlton* MO; *C. Pickering* GH; *W. P. Rich* GH, MIN; *E. F. Williams* GH. ESSEX: *N. C. Fassett* 16029 WIS; *J. H. Sears* DUKE, GH; *E. F. Williams* GH. MIDDLESEX: *Anonymous* GH; *W. J. Beal* MSC; *F. S. Collins* MIN; *G. Engelmann* MO; *H. L. Jones* OC; *G. G. Kennedy* CU, POM, RM, WIS; *T. Morong* ISC, MO; *B. L. Robinson* US; *A. B. Seymour* DUKE; *W. Trelease* ILL, MO. NORFOLK: *C. E. Faxon* GH; *F. F. Forbes* 14464 WIS. SUFFOLK: *J. R. Churchill* MO; *W. P. Rich* GH.

NEW HAMPSHIRE (1901). ROCKINGHAM: *B. L. Robinson* 779 GH; *E. F. Williams* GH. STRAFFORD: *F. C. Seymour* 4855 DUKE, WIS.

NEW JERSEY (1841). Indefinite locality: *R. C. Alexander* UC; *C. F. Austin* GH; *H. R. Bassler* KSC; *P. D. Knieskern* CU; *McMinn* US. ATLANTIC: *W. M. Benner* 9742 WIS; *J. Bright* 10941 MIN, 10942 WIS; *J. B. Brinton* MO. BERGEN: *G. Leiderman* 63 WIS; *K. K. Mackenzie* 602 ARIZ; *H. Moldenke* 13886 CM; *W. Shear* WVA. CAMDEN: *G. W. Bassett* CM, GH, MT; *G. M. Beringer* MICH; *C. D. Fretz* UC; *C. A. Gross* 8 GH; *A. MacElwee* 1299 GH, KSC, MO, MT; *I. C. Martindale* GH, US, WIS; *W. H. Witte* NMC, RM. CAPE MAY: *E. B. Bartram* MT; *J. Bright* CM; *A. Gershoy* 310 CU, GH; *E. P. Killip* 150 US, 316 POM; *F. W. Pennell* 2177 US; *W. H. Witte* RM. CUMBERLAND: *F. W. Pennell* 14867 MIN; *T. Seal* CM. GLOUCESTER: *J. B. Brinton* US; *R. H. True* 5604A UC. HUDSON: *J. Carey* MO; *G. Thurber* GH; *W. M. Van Sickle* US. MIDDLESEX: *L. H. Lighthipe* MSC. MONMOUTH: *A. P. Kelley* MT. SALEM: *E. L. Core* 5016 WVA; *E. C. Earle* 679 TENN; *J. M. Fogg, Jr.* 7792 MIN.

NEW YORK (1873). Indefinite locality: *S. B. Buckley* MO. ALBANY: *H. D. House* 24278 CU, GH, 30376 CU. BRONX: *S. H. Burnham* 726 GH; *J. Cohn* CU. COLUMBIA: *Muenscher & Clausen* 4486 CU. GREENE: *H. D. House* 25167 GH; *Muenscher & Clausen* 4483 CU, GH, 4484 CU, GH, US. MANHATTAN: *E. C. Howe* 2615 IA. NASSAU: *A. Gershoy* CU; *Muenscher & Curtis* 6125 CU, 6126 CU. QUEENS: *F. W. Hulst* ILL; *J. Schrenk* CU. RENSSELAER: *H. D. House* 27059 CAS; *Muenscher, Brown, & Langdon* 21576 CU. RICHMOND: *N. L. Britton* CM; *J. A. Drushel* 8208 ILL, WIS, 8211 ILL, MO; *A. Gershoy* 796 CU. ROCKLAND: *Muenscher & Curtis* 5722 CU. SUFFOLK: *E. S. Miller* CM, US; *Muenscher & Curtis* 6127 CU, 6128 CU; *H. St. John* 2712 CU, GH, US; *H. Schrenk* CU, MO, WIS; *S. H. Wright* MT; *H. W. Young* MT. ULSTER: *Isely, Muenscher, & Winne* 2414 UARK; *Muenscher & Curtis* 5721 CU. WESTCHESTER: *E. C. Howe* ILL; *Muenscher & Curtis* 5718 CU, GH, 5719 CU, 5720 CU, MICH, WIS; *H. Schrenk* MO; *E. H. Walker* US.

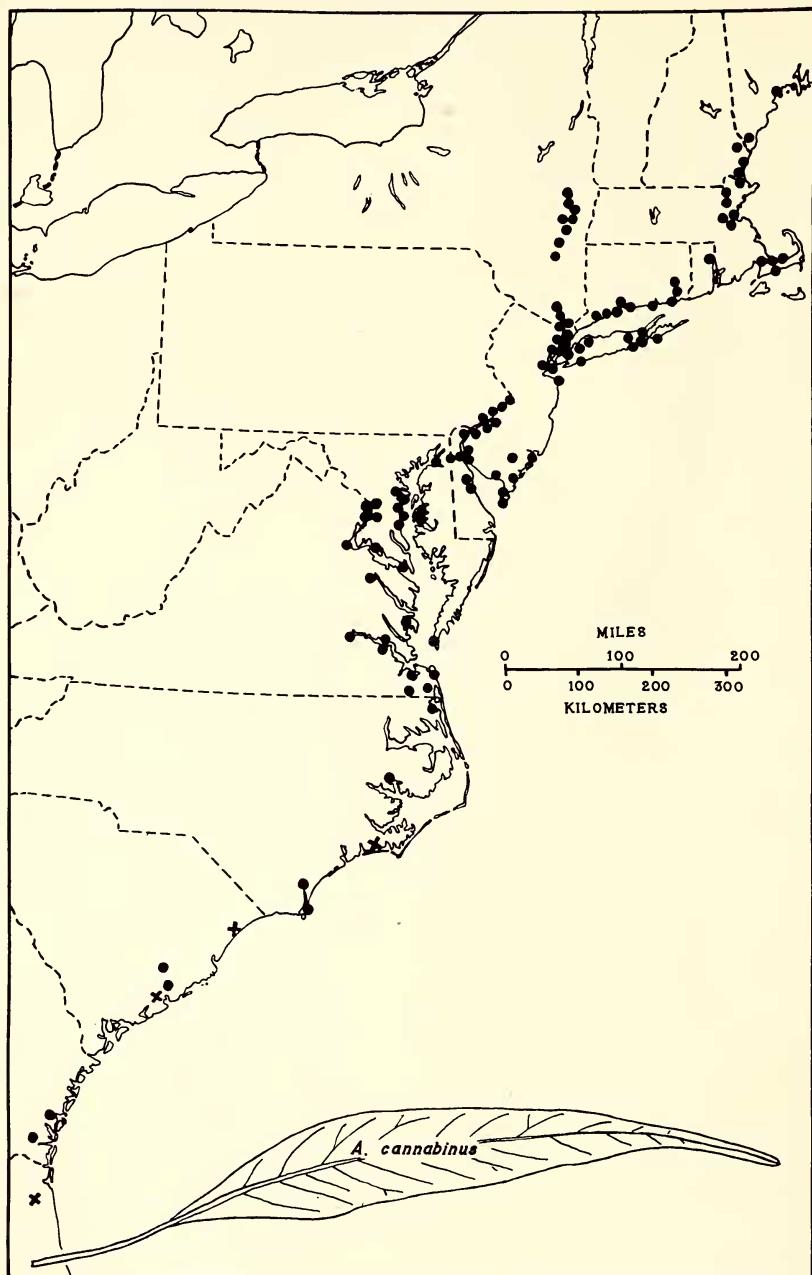


FIG. 3. *Amaranthus cannabinus*: distribution map. Atypical plants indicated by crosses.

NORTH CAROLINA (1885). Indefinite locality: *G. McCarthy* 176 NCU, US. BEAUFORT: *A. E. Radford* 5370 NCU. CARTERET: *A. E. Radford* 5018 NCU. CURRIE-TUCK: *W. L. McAtee* 1170 US. NEW HANOVER: *Anonymous* US; *A. E. Radford* 5039 NCU.

PENNSYLVANIA (1837). Indefinite locality: *E. Durand* GH. BUCKS: *E. B. Bartram* 1292 GH, MT; *W. M. Benner* GH; *R. R. Dreisbach* 3877 MICH. PHILADELPHIA: *R. C. Alexander* UC; *W. M. Benner* 6966 GH; *I. C. Martindale* GH.

RHODE ISLAND (1844). PROVIDENCE: *W. W. Bailey* GH, MO, US; *J. W. Congdon* MIN, MO, NEB; *G. Thurber*, GH.

SOUTH CAROLINA (Before 1900). BERKELEY: *K. W. Hunt* 1276C CU; *H. W. Ravenal* GH. CHARLESTON: *C. P. Alexander* 43 US. HORRY: *W. C. Coker* NCU.

VIRGINIA (1889). Indefinite locality: *F. G. Braendle* MIN. ARLINGTON: *A. Chase* 2674 ILL; *A. S. Hitchcock* ILL; *T. Holm* ILL, MO; *A. J. Pieters* MICH; *E. S. Steele* DUKE, KSC, MIN, MO, MSC, MT, OC. ESSEX: *I. Tidestrom* 7693 US. FAIRFAX: *F. R. Fosberg* 23960 WIS, 23961 WIS; *G. H. Shull* 191 GH, MO, 192 MO. JAMES CITY: *L. C. Artz* 1134 WVA. MATHEWS: *Wherry & Pennell* 12566 MO. NORFOLK: *F. Blanchard* MO, US; *Fernald & Long* 11026 GH, 11027 GH. NORTHAMPTON: *W. M. Canby* ARIZ. PRINCE GEORGE: *Fernald & Long* 10250 GH. PRINCESS ANNE: *Fernald & Griscom* 2820 GH; *Fernald, Long, & Fogg* 4877 GH. STAFFORD: *F. J. Hermann* 9721 GH. SURRY: *Fernald & Long* 9572 GH.

2. *Amaranthus australis* (A. Gray) comb. nov. *Acnida cuspidata* Bert. ex Spreng. Syst. Veg. 3:903. 1826. Non *Amaranthus cuspidatus* Vis. Cat. Hort. Patav. 1841. *Acnida cannabina* L. [var.] β *cuspidata* (Bert. ex Spreng.) Moq. in DC. Prodr. 13(2):277, 1849. *A. australis* A. Gray. Am. Nat. 10:489. 1876. *A. cannabina* L. [var.] *australis* (A. Gray) Uline & Bray, Bot. Gaz. 20:157. 1895. *A. alabamensis* Standl. N. Am. Flora 21:121. 1917.

Although Bertero's *Acnida cuspidata* is the first published name for this entity, because of the homonym rule, Gray's name is the one available when the species is transferred to *Amaranthus*. Gray's species was described from Florida collections which are excellent representatives of the species (syntypes: *A. W. Chapman* s.n., Apalachicola, ♀ GH! here designated as lectotype; *E. Palmer* 462, Biscayne Bay, 1874, ♂ GH!). Standley, in erecting *A. alabamensis* (holotype: *C. T. Mohr* s.n., swampy borders of tidewater streams, One-Mile Creek near Mobile, Alabama, ♀ US!; isotype: ♂ US!), to care for a few collections from the Gulf Coast was recognizing characters to be expected in populations of *A. australis* after slight introgression from *A. tuberculatus*, the other dioecious species in the area, notably, shorter staminate tepals, shorter pistillate bracts and less flattened seeds.

When all the available specimens of *A. australis* and *A. alabamensis* are assembled, morphological intergradation appears to be complete and there is no discontinuity which permits taxonomic separation.

Plants extremely stout and large with many ascending branches, usually 2 to 3 m. tall (although presumably annuals like the rest of the genus, members of this species sometimes reach surprising size, some having been reported as being 9 meters high⁴); leaf-blade lanceolate, often long at-

⁴ Prof. A. J. Sharp has sent me a photograph, taken in a Florida swamp, showing a man climbing one of these plants as if it were a tree.

tenuate at the tip; flowering and fruiting mainly in summer and fall in the northern colonies, in all seasons in tropical colonies; thyrses flexible or moderately stiff, usually 5 to 10 cm. long; the terminal thyrses often accompanied by leafless branch thyrses and the uppermost of these not subtended by leaves; the branch thyrses somewhat more numerous and more crowded in the ♂ than in the ♀ plants; bract 1½ to 2 mm. long, midrib moderately heavy in ♂, heavy in ♀, not conspicuously excurrent in either; ♂ flowers with 5 stamens, the 5 tepals approximately equal, 2½ to 3 mm. long, the inner emarginate, the outer acuminate with excurrent midveins; ♀ flowers without perianth; utricle 1½ to 2 mm. long, indehiscent, slightly fleshy, with 3 to 5 prominent longitudinal ridges corresponding to the 3 to 5 style branches, not rugose, stramineous; seed 1 to 1¼ mm. in diameter, round, somewhat flattened with depressed endosperm, dark reddish brown.

The species is confined to wet places along the margins of both salty and fresh streams and water bodies. Almost every collection bears some such notation as: coastal swamp, mangrove swamp, coastal marsh, canal bank, lakeshore, riverbank, edge of lagoon, along bayou, shore of estuary, low hammock. There is no indication that the plants are every weedy invaders of artificial habitats. An isolated colony on the west coast of Mexico at the port of Manzanillo may have resulted from accidental human transport of seeds. The colony was probably ephemeral since it was reported but once and only staminate plants were found (Rose, 1895, p. 352).

CUBA. HABANA (1917). *Bros. Leon, Marie-Victorin, & Alain* 22355 MT; *Bros. Leon & Roca* 7272 MT.

HAITI. L'ARTIBONITE (1925). *E. L. Ekman* H3358 US; *A. T. Sweet* 70 GH, US.

SUD (1927). *W. J. Eyerdam* 427 GH, US.

JAMAICA. Indefinite locality (ca. 1840). *J. Macfadyen* GH.

CORNWALL (1907). ST. ELIZABETH: *W. Harris* 9760 US. WESTMORELAND: *Britton & Hollick* 2102 US.

MEXICO. *COLIMA (1891). MANZANILLO: *E. Palmer* 1399 US.

QUINTANA ROO (1938). COZUMEL: *Lundell & Lundell* 7777 US.

TABASCO (1889). CENTRO: *J. N. Rovirosa* 672 US.

TAMAULIPAS (1939). ALTAMIRA: *H. LeSueur* 119 ARIZ, US.

*TRINIDAD (1914). *W. E. Broadway* US; *H. Crueger* GH.

UNITED STATES. ALABAMA (1879). MOBILE: *C. T. Mohr* US.

FLORIDA (1867). Indefinite locality: *A. W. Chapman* GH, MO, US, WIS; *R. Combs* 1102 CAS, NMC, RM; *H. C. Cowles* ILL; *J. H. Simpson* KSC, US. ALACHUA: *Laessle, West, & Arnold* FLAS. CITRUS: *A. S. Hitchcock* 591 NEB. COLLIER: *L. H. MacDaniels* CU. DADE: *E. A. Bessey* MSC; *H. N. Moldenke* 531 DUKE, ILL, MO, US; *E. Palmer* 462 GH, MO; *W. Rusby* MICH; *J. K. Small* 10437 DUKE, FLAS, GH, TENN, US, WVA. DESOTO: *H. O'Neill* FLAS, US. DUVAL: *A. Fredholm*

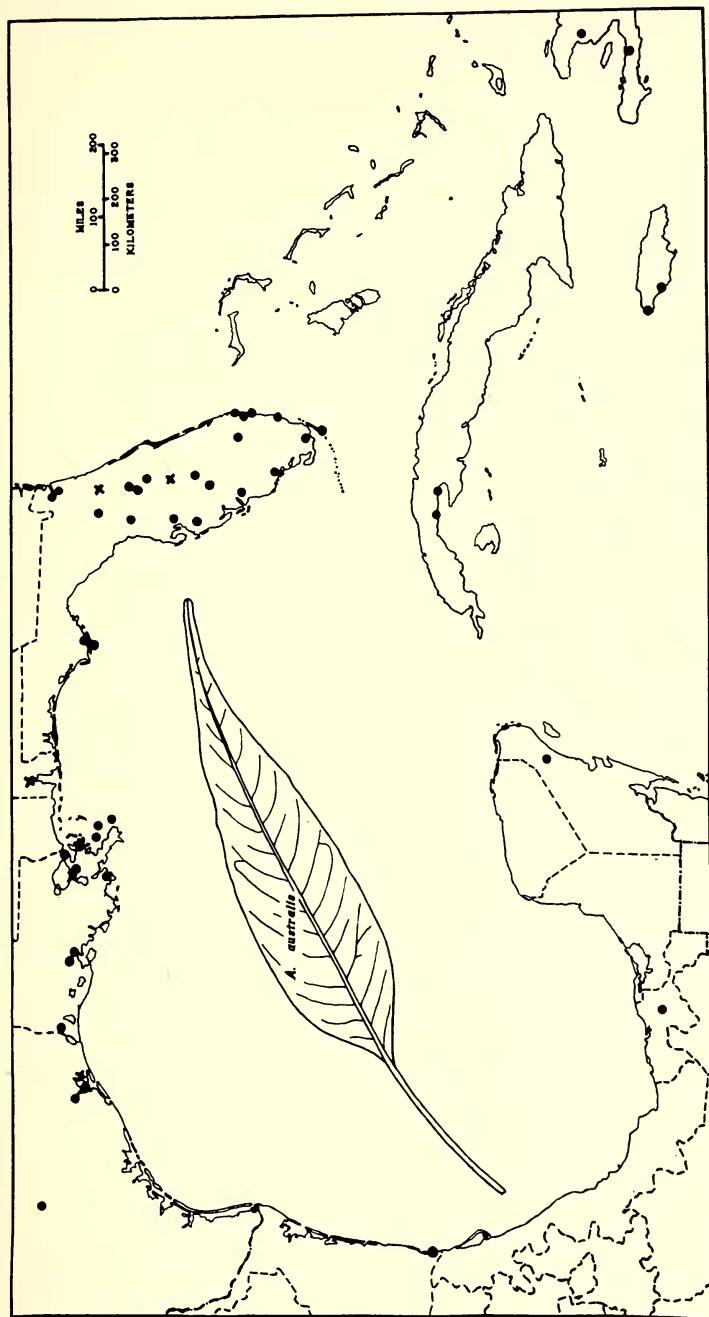


FIG. 4. *Amaranthus australis*: distribution map. Atypical plants indicated by crosses.

300 US. FRANKLIN: *A. W. Chapman* GH, 151A GH, MIN, MO, NCU, US. GULF: *W. L. McAtee* 1720 US; *B. F. Saurman* 381 GH. HIGHLANDS: *J. B. McFarlin* 6029 MICH. HILLSBOROUGH: *J. D. Smith* US. LAKE: *G. V. Nash* 868 CU, GH, MICH, MIN, MO, MSC, NEB, UC, US; *J. R. Watson* 77 FLAS. LEE: *A. S. Hitchcock* 299 CU, GH, KSC, MIN, MO, NEB, US. MANATEE: *J. H. Simpson* MIN, MO, US, WIS. MONROE: *Muenscher & Thorne* 18344 CU. ORANGE: *A. Fredholm* 5470 GH. PALM BEACH: *M. F. Baker* FLAS; *J. A. Harris* N19335 MIN; *M. J. Murray* 36075 CU, 36076 CU, 38135 CU; *H. O'Neill* MO; *Small & Carter* MIN; *Tisdale, Townsend, & West* FLAS. POLK: *J. B. McFarlin* 4459 CAS, 4460 MICH. PUTNAM: *A. M. Laessle* FLAS.

LOUISIANA (1886). IBERIA: *Correll & Correll* 9535 DUKE, GH, MO. LA FOURCHE: *G. Arceneaux* 95 CU. ORLEANS: *R. S. Cocks* NO; *G. L. Fisher* WIS; *J. F. Joor* MO, US; *J. L. Riddell* NO; *E. Wilkinson* OC. PLAQUEMINES: *Lloyd & Tracy* 41 CM; *Tracy & Lloyd* 24 CU, GH, MIN, MO, MSC, NEB, US, 37 CM, CU, GH, MIN, MO, NEB, UC, US, WIS. ST. BERNARD: *J. F. Joor* MO. ST. TAMMANY: *W. T. Penfound* NO. VERMILLION: *C. C. Sperry* 385 US.

TEXAS (1884). HARRIS: *G. L. Fisher* CAS, 27 MT, US, 165 US; *J. F. Joor* MIN, MO, WIS. ORANGE: *V. L. Cory* 50863 SMU. TRAVIS: *B. C. Tharp* 2864 MICH, US.

*VENEZUELA. ARAGUA (1942). *Killip & Lasser* 37736 US; *H. Pittier* 14996 US.

3. ***Amaranthus tuberculatus*** (Moq.) comb. nov. *A. altissimus* Riddell, Syn. Fl. W. States 41. 1835, *nom. prov.* *A. miamiensis* Riddell, loc. cit. 41. 1835, *nom. prov.* *Acnida tuberculata* Moq. in DC. Prodr. 13(2):277. 1849. *A. altissima* (Riddell) Moq. loc. cit. 278. 1849, *no:n. nudum*. *A. canabina* L. [var.] β *concatenata* Moq. loc. cit. 278. 1849. *Montelia tamariscina* (Nutt.) A. Gray var. *concatenata* (Moq.) A. Gray, Man. ed. 2. 370. 1856. *Acnida tuberculata* Moq. var. *subnuda* S. Wats. in A. Gray, Man. ed. 6. 429. 1889. *A. tamariscina* (Nutt.) Wood [var.] *subnuda* (S. Wats.) Coulter. Mem. Torrey Club 5:145. 1894. *A. tamariscina* (Nutt.) Wood [var.] *tuberculata* (Moq.) Uline & Bray, Bot. Gaz. 20:157. 1895. *A. tamariscina* (Nutt.) Wood [var.] *prostrata* Uline & Bray, loc. cit. 158. 1895. *A. tamariscina* (Nutt.) Wood [var.] *concatenata* (Moq.) Uline & Bray, loc. cit. 158. 1895. *A. concatenata* (Moq.) Small, Fl. S.E. U.S. 393. 1903. *A. tuberculata* Moq. var. *prostrata* (Uline & Bray) B. L. Robinson, Rhodora 10:32. 1908. *A. altissima* (Riddell) Moq. ex Standl. N. Am. Flora 21:122. 1917. *A. subnuda* (S. Wats.) Standl. loc. cit. 122. 1917. *Amaranthus ambigens* Standl. loc. cit. 106. 1917. *Acnida altissima* (Riddell) Moq. ex Standl. var. *prostrata* (Uline & Bray) Fernald, Rhodora 43:288. 1941. *A. altissima* (Riddell) Moq. ex Standl. var. *subnuda* (S. Wats.) Fernald, loc. cit. 288. 1941.

This species probably first received taxonomic attention from Riddell, who proposed two new species, presumably based on his own Ohio collections: *Amaranthus altissimus* from "an old prairie near Hamilton," and *A. miamiensis* from "Hoffman's prairie, Dayton." His incomplete descriptions together with the localities suggest that both names refer to the taxon under consideration here. Unfortunately, Riddell added the statement: "I give these as merely temporary names, until the plants shall be

further investigated," thereby invalidating his publication of the names. One of his epithets, *miamiensis*, has never been validly published; the other was eventually adopted by Standley in a new combination but by then it was nomenclaturally superfluous. Although Moquin-Tandon cited no specimens, his description of *A. tuberculata*, made from living plants in the Geneva Botanical Garden leaves little doubt as to its identity. His type specimen of var. *concatenata* (holotype: *T. Drummond* 552, pro-cumbent, New Orleans, Louisiana, 1832. Fragment in GH!), originally assigned to another species, although subtly different from typical *A. tuberculatus* (suggesting slight introgression from *A. australis*) is morphologically well within the limits of the species as defined here. In various combinations and ranks, *concatenata* has generally been recognized by subsequent workers as a distinct taxon. It has ordinarily been distinguished from *A. tuberculatus* by unusually large, round, widely-spaced glomerules, which give the pistillate inflorescence the look of a loose string of giant beads. Such inflorescences develop occasionally in many kinds of amaranths, either sterile hybrids or isolated pistillate plants which are not pollinated; in such plants seed set does not arrest vegetative growth of the inflorescence axis and flower initiation in each cyme. Watson's variety *subnuda* (holotype: *Oakes s.n.*, W. Vermont) is a different story. Watson's statements on morphology and geography indicate that his conception of the species proper was based on plants which were probably mostly hybrids between *A. tuberculatus* and *A. tamariscinus* while his variety was based on *A. tuberculatus* in its purest and most typical form. Uline and Bray distinguished their variety *prostrata* by a prostrate habit, small spatulate leaves, and a poorly developed terminal thyrsse. They cited no specimens but stated "type specimens in Nat. Herb. and Mo. Bot. Gard." They apparently marked no sheets as types, but the following specimens bear their annotations as representing this variety: *G. Engelmann* 257, 258, St. Louis, Missouri, August to September, 1893, ♂ ♀ MO!; *G. Engelmann s.n.*, American Bottom, Illinois, opposite St. Louis, October 7, 1867, ♂ ♀ MO! WIS!; *C. A. Geyer* 420, Nicollet's Northwestern Expedition, Fort Pierre (South Dakota), June 29, 1839, ♀ US!; *E. Hall s.n.*, riverbanks, Athens, Illinois, 1861, ♀ US!; *G. H. Hicks s.n.*, Michigan Agricultural College grounds, September 1, 1892, ♀ US!; *J. M. Holzinger s.n.*, Winona, Minnesota, August, 1890, ♂ ♀ US!. All these specimens are well within the range of *A. tuberculatus* as circumscribed here, although the Engelmann collections show traces of mixing with *A. tamariscinus*. These specimens, and many others like them, are indeed conspicuously different from the usual form of *A. tuberculatus*, but the difference may not be hereditary. The key to the dissimilarity may be found in an unheeded note by Engelmann on his American Bottom collection: "*forma autumnalis*, in the bottom of dried swamps, a second crop." These plants are extremely sensitive to photoperiod, flower initiation being approximately simultaneous in all individuals within an area, regardless of size. By early and late greenhouse plantings, I have been able to obtain both

ordinary *tuberculatus* and the *prostrata* forms from seed of a single plant (*J. D. Sauer* 1592-4, 1592-4A, 1592-10, 1592-10A, WIS). Standley's *A. ambigens* is based on a sheet (*M. S. Bebb* s.n., Fountaintdale, Illinois, US!) bearing two plants, one of them an ordinary staminate plant and the other bearing abortive bisexual flowers, an anomaly among both dioecious and monoecious amaranths. Other sheets of this collection (CU!, MINN!, US!) bear only ordinary specimens of *A. tuberculatus*. Comparable monstrosities with sterile bisexual flowers have been collected elsewhere within the range of *A. tuberculatus* (*A. P. Anderson* s.n., Goodhue County, Minnesota, US!; *W. S. Moffat* s.n., DuPage County, Illinois, ILL!; *L. S. Cheney*, Dane County, Wisconsin, WIS!), as well as within the range of *A. arenicola* (*G. E. Osterhout* 1141, Logan County, Colorado, RM!).

Plants extremely variable in habit and size, prostrate, ascending, or erect, often very short but sometimes reaching 3 m. in height; leaf-blades extremely variable in size and shape, the smaller ones usually oblong or spatulate, the larger broadly ovate or lanceolate; flowering and fruiting entirely during summer and fall, mainly late July to early October; thyrses flexible, usually about 5 cm. long in ♂, 1 to 2 cm. long in ♀; in the ♂ plants several loosely arranged, leafless branch thyrses often present above the uppermost leaves; ♀ thyrses either entirely terminal on leafy branches or, if leafless branch thyrses present, these crowded and each subtended by a leaf; bract 1 to 1½ mm. long; midrib very slender in ♂, slender in ♀, excurrent far beyond lamina; ♂ flowers with 5 stamens, the 5 tepals approximately equal, 2½ to 3 mm. long, the inner obtuse or emarginate, outer acuminate, the midveins not excurrent; ♀ flowers usually without perianth, occasionally with 1 or 2 irregular, rudimentary tepals; utricle 1½ to 2 mm. long, indehiscent, thin, smooth or irregularly tuberculate, sometimes with faint ridges corresponding to the 3 or 4 style branches, often reddish; seeds ¾ to 1 mm. in diameter, often obovoid, lenticular, dark reddish brown.

The species is at home on the margins of freshwater bodies of all sorts: rivers, creeks, lakes, ponds, marshes, and bogs. Nearly 90 per cent of all collections which bear habitat data are from such places. The plants are especially abundant in a narrow zone close to the water's edge, where falling water level has exposed a strip of bare sand or mud. Much of the vegetative variability within the species may be traceable to variations in the growing season available in such sites. The species also occupies another quite different group of habitats: artificially disturbed places such as fields, gardens, and roadsides. Where such places are available in low ground close to its natural habitats, the species commonly moves in as a weed. Elsewhere it has had little success as a weed.

CANADA. ONTARIO (1871). CARLETON: *Frere Marie-Victorin* MT; *Frere Rolland* GH, IND, MT. ESSEX: *W. S. Cooper* ARIZ. HASTINGS: *J. Macoun* 1506 GH. HURON: *J. A. Morton* 1828 ILL, MIN, US. RUSSELL: *J. Macoun* 86622 GH, 86623 GH, 86624 GH.

QUEBEC (1889). WRIGHT: *J. Macoun* GH, MO, 16 GH; *W. Scott* CU.

UNITED STATES. ALABAMA (ca. 1875). Indefinite locality: *S. B. Buckley* MO.

ARKANSAS (1929). CHICOT: *D. Demaree* 14062 (in part) US. CRAIGHEAD: *D. Demaree* 7095 GH, TEX, UARK, US, WIS, 27501 ISC. MISSISSIPPI: *D. Demaree* 7186 US. PHILLIPS: *D. Demaree* 30234 OKL, TEX.

CONNECTICUT (1896). HARTFORD: *C. H. Bissell* GH. NEW HAVEN: *E. B. Harger* 18 GH.

ILLINOIS (1840). ADAMS: *R. Brinker* 3768 ILL. CARROLL: *M. B. Waite* ILL. CHAMPAIGN: *G. P. Clinton* ILL; *F. Coates* ILL; *H. A. Gleason* 76 GH; *G. N. Jones* 12905 IA, ILL, MIN, MO, US, 13136 ILL, 13279 ILL; *A. S. Pease* 13016 GH; *A. B. Seymour* DUKE; *W. Trelease* ILL. CHRISTIAN: *W. E. Andrews* ILL. COOK: *R. Bebb* 2123 MIN, OKL, WIS; *J. R. Churchill* GH, RM; *G. Engelmann* MO; *E. J. Hill* 74 ILL, 116 ILL, 165 ILL; *W. S. Moffatt* MIN, OC, WIS, 429 ILL, 611 ILL, OC; *N. L. T. Nelson* MIN, UC, WIS; *W. C. Ohlendorf* MO, US; *L. H. Pammel* ISC; *E. E. Sherff* 1726 MO; *M. W. Strahler* WIS; *L. M. Umbach* 1168 WIS, 1333 WIS, 4880 WIS, 5931 WIS; *G. S. Winterriger* 1558 ILL, US. DOUGLAS: *G. S. Winterriger* 153 ILL. DU PAGE: *W. S. Moffatt* ILL, 267 ILL, 287 MIN, 609 WIS, 612 ILL, MO; *L. M. Umbach* GH, ILL, MICH, MIN, MO, MSC, OC, OKL, UC, US, WIS. FULTON: *V. H. Chase* 10908 ILL. GRUNDY: *G. S. Winterriger* 81 ILL, 83 ILL. HENDERSON: *H. N. Patterson* GH, ILL, MO, US, WIS. IROQUOIS: *G. S. Winterriger* 84 ILL. JACKSON: *H. E. Ahles* 5769 ILL; *H. A. Gleason* 1685 GH. KANE: *J. D. Sauer* 1599 WIS. KANKAKEE: *Anonymous* ILL; *C. C. Crampton* 540 US. KENDALL: *G. S. Winterriger* 82 ILL. LAKE: *O. C. Durham* GH; *E. J. Palmer* 28331 MO; *L. M. Umbach* 1353 WIS. LASALLE: *G. Engelmann* MO; *G. D. Fuller* 3256 (in part) ILL; *Koster & Koster* 5 CU, 6 CU; *L. M. Umbach* WIS, 955 WIS. LAWRENCE: *J. P. Sivert* ILL. LIVINGSTON: *J. D. Sauer* 1601 ILL, NO, WIS. MACON: *R. G. Mills* ILL; *G. S. Winterriger* 639 ILL. MACOUPIN: *W. E. Andrews* ILL; *J. D. Sauer* 1608 WIS. MASON: *H. E. Ahles* 3423 ILL; *R. J. Miller* ILL. MCHENRY: *W. A. Nason* ILL; *G. R. Vasey* MO. MCLEAN: *Anonymous* CM; *J. D. Sauer* 1606 ILL, NO, WIS. MENARD: *E. Hall* ILL, US. OGLE: *M. S. Bebb* CU, MIN, US; *M. B. Waite* US. PEORIA: *H. A. Anderson* IA; *F. Brendel* ILL, US; *F. E. McDonald* ILL, NMC, UC; *J. T. Stewart* WIS. PIATT: *A. S. Pease* 14086 GH; *A. B. Seymour* DUKE. PIKE: *J. Davis* 3785 ILL; *J. D. Sauer* 1618 ILL, WIS. POPE: *E. J. Palmer* 17018 MO. PUTNAM: *V. H. Chase* 10832 ILL, 10833 ILL. RANDOLPH: *H. E. Ahles* 5635 ILL. ROCK ISLAND: *A. B. Seymour* DUKE; *B. Shimek* IA. SAINT CLAIR: *E. Douglass* WIS; *H. Eggert* CU, CM, GH, KSC, MIN, MO, UC, US, WIS; *G. Engelmann* MO, WIS; *A. S. Hitchcock* MO; *J. H. Kellogg* MO; *J. B. S. Norton* WIS; *L. H. Pammel* WIS; *J. A. Steyermark* 843 MO; *L. F. Ward* US; *W. Welsch* ILL. SANGAMON: *G. D. Fuller* 7911 ILL. SCHUYLER: *J. D. Sauer* 1618 ILL, WIS. STARK: *V. H. Chase* 714 MO, 4375 WIS. STEPHENSON: *C. F. Johnson* US. TAZEWELL: *V. H. Chase* 3223 MO, 7914 ILL, 7915 ILL, 10900 ILL; *A. B. Seymour* DUKE. WABASH: *J. Schneck* GH, ILL, 97 ILL; *H. Shearer* ILL. WINNEBAGO: *R. B. Anthony* WIS; *M. S. Bebb* IA, ILL, MICH, MO, OKL, WIS; *S. C. Wadmon* MIN.

INDIANA (1854). BLACKFORD: *C. C. Deam* 343 US. CLARK: *C. Mohr* US. DEARBORN: *C. C. Deam* 50790 WIS, 55886 WVA. ELKHART: *J. S. Brooks* 1447 IND. HOWARD: *C. M. Ek* CAS, 153 US. JACKSON: *C. C. Deam* 38062 IND. JAY: *C. C. Deam* 59138 IND. JOHNSON: *H. M. Clarke* WIS. KOSCIUSKO: *C. C. Deam* 21931 IND, 21984 IND; *Yunker & Welch* 10666 GH, NO. LAKE: *C. C. Deam* 1760 IND; *J. M. Greenman* 3192 MO; *P. C. Standley* 57472 IND, 57476 IND; *L. M. Umbach* US, 1376 WIS, 1381 WIS, 4678 WIS. LAWRENCE: *R. M. Kriebel* 1354 IND. MARION: *R. C. Friesner* 18125 GH, OC, WVA, 18126 OKL; *W. Rhoades* TENN; *J. S. Wright* NMC. MARSHALL: *C. C. Deam* 21010 IND; *Scovell & Clark* 1364 US. MONTGOMERY: *E. W. Olive* SDC. MORGAN: *P. Weatherwax* IND. NEWTON: *C. C. Deam* 57326 IND. NOBLE: *C. C. Deam* 54495 IND. OWEN: *C. C. Deam* 23928 IND; *Haas & Welch* 4971

IND, 4972 IND, 4973 IND; *S. C. Hood* 4025 FLAS. PORTER: *C. C. Deam* 26526 IND; *E. J. Hill* 119 ILL; *L. M. Umbach* 5134 WIS. POSEY: *C. C. Deam* 10062 IND, 22292 IND, 22297 IND, 22298 MIN, 22304 CAS, 24293 MT, 24303 MT. PULASKI: *C. C. Deam* 46363 IND. RANDOLPH: *C. C. Deam* 15442 IND, MIN. RIPLEY: *C. C. Deam* 55894 IND. ST. JOSEPH: *J. A. Nieuwland* MT, US, 11511 MO. VANDERBURG: *H. M. Zelner* IND. WARREN: *C. C. Deam* 51294 IND. WELLS: *C. C. Deam* IND, 467 IND. WHITE: *C. C. Deam* 51252 IND. WHITLEY: *C. C. Deam* 59164 IND, OKL.

IOWA (1873). Indefinite locality: *J. C. Arthur* 65 MO. ALLAMAKEE: *W. L. Tolstead* ISC. BENTON: *J. J. Davis* WIS. BLACKHAWK: *M. Burk* 581 MO, 874 ILL, 892 ILL, MO. BOONE: *G. M. Lummis* ISC. BREMER: *B. Shimek* IA. BUTLER: *J. D. Sauer* 1696 WIS. DES MOINES: *P. Bartsch* IA. DICKINSON: *B. Shimek* IA. DUBUQUE: *A. Horr* GH; *W. A. Weber* 1937 COLO. EMMET: *R. I. Cratty* IA, OC; *F. W. Paige* ISC; *B. Shimek* IA. FAYETTE: *B. Fink* GH, ISC, MIN, OC, US. HAMILTON: *B. Shimek* IA. HANCOCK: *B. Shimek* IA. HARDIN: *L. H. Pammel* ISC; *B. Shimek* IA. JOHNSON: *A. S. Hitchcock* IA, MO; *B. Shimek* IA; *M. P. Somes* 3910 US, 4400 ISC, 4428 ISC, 4429 ISC. LEE: *J. L. Fults* 1624 (in part) ISC; *L. H. Pammel* ISC; *P. H. Rolfs* ISC; *B. Shimek* IA. MUSCATINE: *H. W. Clark* US; *F. Reppert* IA; *M. P. Somes* 3722 MO. STORY: *Anonymous* ISC; *C. E. Bessey* GH; *A. Hayden* 319 ISC; *A. S. Hitchcock* KSC, MO, MSC. WAPELLO: *L. H. Pammel* ISC. WARREN: *L. H. Pammel* ISC. WEBSTER: *C. H. Churchill* ISC. WINNEBAGO: *L. H. Pammel* ARIZ; *B. Shimek* IA. WINNESHEIK: *H. Goddard* ISC; *W. L. Tolstead* ISC.

KENTUCKY (1840). Indefinite locality: *C. W. Short* CINC, MO. BRECKENRIDGE: *McFarland, Plymale, & Schacklette* 14 MT. KENTON: *M. G. Williams* WIS.

LOUISIANA (1832). Indefinite locality: *W. M. Carpenter* MO, US, WIS. AVOYELLES: *G. Ware* WIS. ORLEANS: *R. S. Cocks* NO; *T. Drummond* 552 GH; *J. F. Joor* MIN, MO. RAPIDES: *J. Hale* US. ST. CHARLES: *J. Howard* NO.

*MAINE (1899). OXFORD: *W. H. Allen* GH.

*MASSACHUSETTS (1899). HAMPDEN: *L. Andrews* 6 GH. MIDDLESEX: *M. L. Loomis* GH; *E. F. Williams* GH. WORCESTER: *Anonymous* GH.

MICHIGAN (1838). Indefinite locality: *E. J. Cole* MIN; *C. F. Wheeler* MIN, MSC. BERRIEN: *C. Billington* MICH, MSC. CASS: *H. S. Pepoon* 73 MSC. GENEESEE: *D. Clarke* 23 CM, 466 (in part) MSC, 2023 MSC. GRATIOT: *C. A. Davis* GH, ILL, MICH, MIN, MO, MSC, OC, POM, RM, TENN, UC, WIS. INGHAM: *L. H. Bailey*, Jr. GH; *C. F. Baker* POM; *W. J. Beal* MSC; *G. H. Hicks* US; *H. C. Skeels* MSC; *G. D. Sones* MO; *J. W. Toumey* ARIZ, NDA; *C. F. Wheeler* MSC, WIS. IONIA: *C. F. Wheeler* POM, US. KENT: *C. W. Bazuin* 711 MSC; *W. Boott* GH; *H. C. Skeels* MSC. LENAWEE: *C. H. Stocking* MICH. MACOMB: *D. Cooley* MSC. MONROE: *M. E. Day* OC. MUSKEGON: *C. D. McLouth* MSC. OAKLAND: *C. Billington* MICH. OTTAWA: *E. J. Cole* MSC. SAINT CLAIR: *C. K. Dodge* GH, MICH, MIN, MO, MSC, OC, RM, TENN, TEX, US, WIS, 266 US. VAN BUREN: *L. M. Umbach* WIS. WASHTENAW: *C. Billington* MICH; *J. H. Ehlers* 1452 MICH, 5503 MICH; *F. J. Hermann* 9178 MICH, MO, US; *A. J. Pieters* MICH.

MINNESOTA (1848). Indefinite locality: *C. C. Parry* US. AITKIN: *J. H. Sandberg* 767 MIN, MSC, US. BELTRAMI: *Butters & Rosendahl* 6578 MIN; *P. Jones* 422 MIN, 423 MIN. CASS: *E. L. Nielson* 1799 MIN. CHIPPEWA: *L. R. Moyer* 1410 MIN; *J. B. Moyle* 3255 MIN, 3505 MIN. CLAY: *H. F. Bergman* NDA. CLEARWATER: *M. L. Grant* 3139 MIN. FREEBORN: *J. B. Moyle* 4001 MIN. GOODHUE: *A. P. Anderson* GH, UC, US, WIS, 772 MIN, 830 MIN; *C. O. Rosendahl* 6792 MIN; *J. H. Sandberg* MIN. HENNEPIN: *F. H. Burglehaus* MIN; *Butters & Rosendahl* 3410 CU, MIN, 3413 MIN, 3414 MIN; *E. A. Mearns* 837 US; *T. S. Roberts* MIN. HOUSTON: *W. A. Wheeler* 522 MIN, 547 MIN, 598 MIN. LESUEUR: *J. B. Moyle* 2901 MIN. RAMSEY: *E. Mearns* 839 US; *Moore & Moore* 13631 GH, ISC, MIN. RICE: *Moore & Moore* 10283 MIN, 10284 IA, ILL, MIN, MT, UC. STEARNS: *F. W. Dewart* MO. WABASHA: *S. M. Manning* MIN; *L. H. Pammel* ISC. WASHINGTON: *J. W. Moore* 16048 MIN;

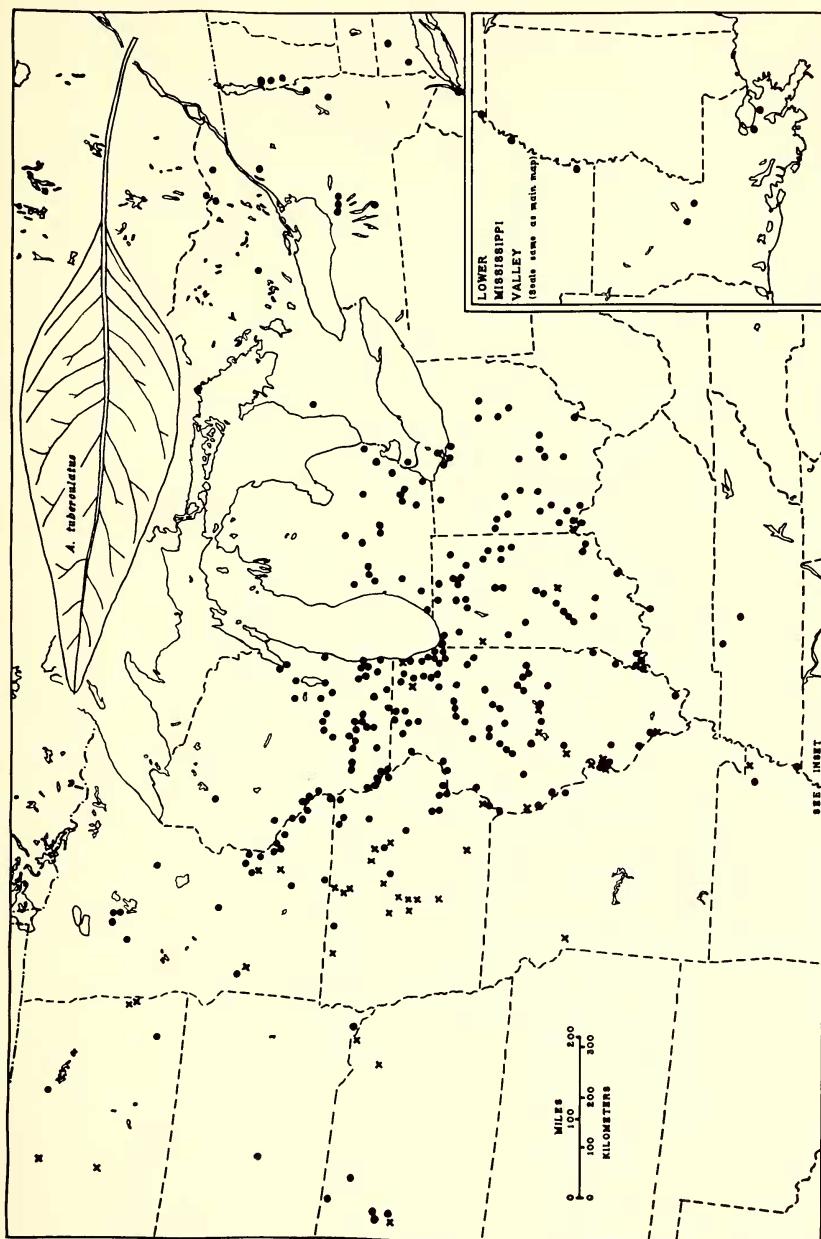


FIG. 5. *Amaranthus tuberculatus*: distribution map. Atypical plants indicated by crosses.

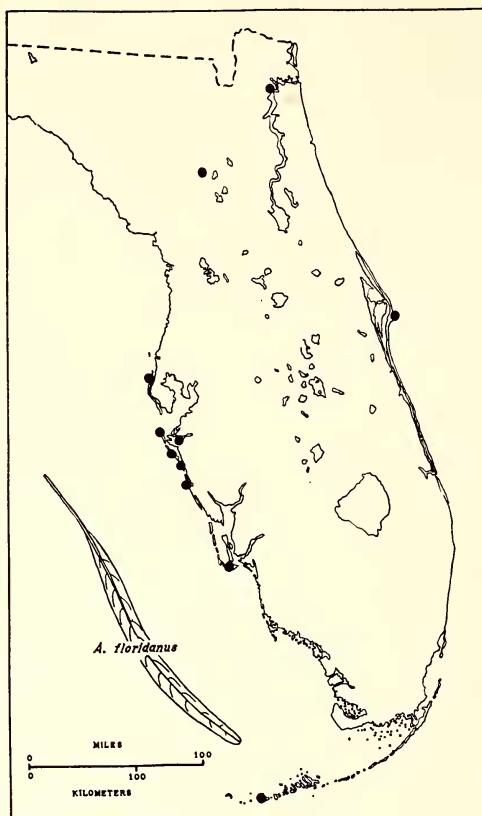


FIG. 6. *Amaranthus floridanus*: distribution map.

Moore & Moore 10434 MIN, TEX, 10630 MIN. WINONA: J. M. Holzinger CU, ISC, MIN, RM, US, UTC.

MISSOURI (1832). JACKSON: B. F. Bush 278 KSC, MO, US, WIS. PIKE: W. Trelease 816 MO. SAINT CHARLES: E. Douglass MO. SAINT LOUIS: T. Drummond GH, 38 GH, 311 (in part) GH; G. Engelmann GH, 255 MO, 257 MO, 258 MO; L. O. Overholts MO; J. A. Steyermark 8971 MO; W. Trelease MO, WIS.

NEBRASKA (1853). Indefinite locality: F. V. Hayden MO; P. A. Rydberg NEB. CEDAR: T. A. Bruhin WIS. CHERRY: J. M. Bates NEB; R. Thomson 83 US. GRANT: Rydberg & Tulen 1644 NEB, US, 1674 (in part) GH, 1778 NEB, US. HOOKER: R. Thomson 265 US. PIERCE: N. F. Petersen NEB.

NEW YORK (1900). CAYUGA: M. R. Garner 19389 CU. ONONDAGA: Muenscher & Brown 22061 CU, GH; K. M. Wiegand CU. RICHMOND: A. Hollick US. SAINT LAWRENCE: O. P. Phelps 418 CU, GH, US, 1152 CU, GH, 1153 CU, GH. SARATOGA: Muenscher & Lindsey 3239 CU. TOMPKINS: F. P. Metcalf 6399 CU. WASHINGTON: S. H. Burnham GH.

NORTH DAKOTA (1860). BENSON: J. Lunell 408 MIN, 585 MIN. CASS: H. F. Bergman MO, MIN, NDA; O. A. Stevens NDA, 1399 NDA, WIS. OLIVER: F. V. Hayden MO. RANSOM: Fieldstand 1097 NDA. WARD: O. Lakela 504 MIN.

OHIO (1833). Indefinite locality: J. R. Paddock ILL; R. Peter MICH. AUGLAIZE: A. Wetzstein OS. BUTLER: D. Demaree 27354 ISC. CHAMPAIGN: W. A. Keller-

man OS. CLERMONT: *E. L. Braun* CINC; *D. L. James* OS; *James & James* OS. COSHOCTON: *F. B. Selby* 209B OS. ERIE: *E. L. Moseley* CM, US; *W. Whitney* OC. FAIRFIELD: *W. Goslin* OS; *Goslin & Goslin* OS. FRANKLIN: *M. J. Murray* 38140 CU; *Schaffner & Brown* 4 OS; *W. C. Werner* 110 (in part) GH, 111 GH. GREENE: *M. Mohr* 577 CINC. HAMILTON: *Anonymous* CINC; *E. L. Braun* CINC; *R. Buchanan* CINC; *T. H. Kearney, Jr.* OS; *C. G. Lloyd* US, 2376 GH, MICH, MSC; *C. W. Short* GH; *M. G. Williams* WIS. HOLMES: *W. A. Kellerman* OS. LOGAN: *Kellerman & Beattie* OS. LUCAS: *E. L. Moseley* MICH. MEIGS: *W. A. Kellerman* OS. MERCER: *C. E. Thorne* 1794 OS. MONTGOMERY: *B. Frank* MO; *S. E. Horlacher* OS. OTTAWA: *E. L. Moseley* GH, OS, US. PICKAWAY: *Bartley & Pontius* OS. ROSS: *Bartley & Pontius* OS. SHELBY: *Kellerman & Beattie* OS; *E. S. Thomas* OS. STARK: *Mrs. T. W. Case* OS. WARREN: *E. B. Harger* 8180 GH. WAYNE: *Bontrager & Greene* OS.

SOUTH DAKOTA (1839). CLAY: *W. H. Over* 5136 US. STANLEY: *C. A. Geyer* 420 US.

TENNESSEE (1877). DAVIDSON: *A. Gattinger* US; *W. H. Seaman* US; *L. F. Ward* MO, US. MONTGOMERY: *A. Clebsch* 664 TENN. SHELBY: *Norris & Sharp* 16323 TENN, 16327 TENN.

VERMONT (1882). ADDISON: *E. Brainerd* GH; *C. E. Faxon* GH. RUTLAND: *D. L. Dutton* CM, CU, DUKE, KSC, MO.

WISCONSIN (c. 1845). ADAMS: *N. C. Fassett* 22735 WIS. BROWN: *J. H. Schutte* CAS, GH, IA, MICH, MIN, OKL, POM, UC, US, WIS. BUFFALO: *R. H. Dennis* 1000 WIS. DANE: *R. Burton* 40 WIS; *L. S. Cheney* WIS; *J. R. Churchill* GH, MO, WIS; *J. J. Davis* GH, WIS; *N. C. Fassett* 22733 WIS, 22734 WIS; *T. J. Hale* WIS; *J. R. Heddle* 1430 WIS; *G. N. Jones* 17694 ILL; *J. D. Sauer* 1590 ARIZ, CAS, COLO, FLAS, MT, NCU, NDA, NMC, NO, SDC, TENN, UARK, 1592 WIS; *L. H. Shinners* 1460 WIS; *E. E. Terrell* 2422 WIS; *W. Trelease* MO, WIS; *R. H. True* WIS; *J. H. Zimmerman* 3426 WIS, 3608 WIS. DODGE: *L. H. Shinners* 1458 WIS. FOND DU LAC: *J. J. Davis* WIS; *Waters & Pammel* ISC. GRANT: *R. B. Anthony* MIN, WIS; *J. J. Davis* UC, WIS; *N. C. Fassett* 12620 WIS, 13649 WIS, 13656 WIS, 14168 WIS, 14170 WIS, 14201 WIS; *H. H. Smith* 7738 WIS, 7739 WIS. GREEN LAKE: *Fassett & Sperry* 18389 WIS; *L. H. Shinners* WIS. IOWA: *J. J. Davis* WIS; *G. N. Jones* 17633 ILL; *C. T. Mason, Jr.* 1489 WIS. LA CROSSE: *J. J. Davis* WIS; *D. S. Pammel* ISC; *L. H. Pammel* ISC, UTC. LAFAYETTE: *L. S. Cheney* WIS. MARQUETTE: *N. C. Fassett* 15327 WIS. MILWAUKEE: *I. A. Lapham* GH, WIS; *Morgan & Morgan* 635 IA; *W. W. Oppel* C2 GH; *R. Pohl* 1343 MIN; *L. H. Shinners* 1457 WIS. OUTAGAMIE: *P. O. Schallert* 658 DUKE. PEPIN: *E. A. Baird* WIS. PIERCE: *N. C. Fassett* 5314 WIS. RACINE: *J. J. Davis* DUKE, ILL, WIS; *J. R. Heddle* 300 WIS; *S. C. Wadmond* MIN. RICHLAND: *E. K. Jones* 406 WIS. ROCK: *G. B. Olds* WIS; *G. D. Sweeney* CAS. SAUK: *J. J. Davis* WIS; *Levi & Rose* WIS; *H. F. Luders* US; *A. B. Seymour* DUKE. SAWYER: *Gilbert & Fassett* 8228 WIS. SHEBOYGAN: *C. Goessl* WIS. TREMPEALEAU: *E. A. Baird* WIS; *N. C. Fassett* 5311 WIS, 5312 GH, DUKE, WIS. WALWORTH: *G. R. Kleeberger* CAS; *S. C. Wadmond* MIN. WAUKESHA: *G. H. Cornwell* WIS; *I. Cull* 315 WIS; *H. C. Greene* WIS. WAUPACA: *Fassett & Rhodes* 13169 WIS.

4. *Amaranthus floridanus* (S. Wats.) comb. nov. *Acnida floridana* S. Wats. Proc. Am. Acad. 17:376. 1882.

This species was described from a homogeneous group of Florida collections (syntypes; *J. L. Blodgett* s.n., Key West, ♂ GH!, here designated as lectotype; *A. W. Chapman* s.n., sandy coast at North Clear Water Pass, 1875, ♀ MO!; *A. P. Garber* s.n., South Florida, 1876, ♀ GH!). Watson also mentioned a Curtiss collection without identifying it (probably *A. H. Curtiss* 115, Florida, 1880, ♀ GH!).

Plants slender, erect, with ascending branches, usually about 1 m. tall; leaf-blade very small, linear to narrowly oblong; flowering and fruiting from late spring through early fall; thyrses flexible, usually 10 to 20 cm. long, either all terminal on leafy branches or, if leafless branch thyrses present, these widely spaced and each subtended by a leaf; bract 1 to 1½ mm. long, the midrib moderately heavy in ♂, heavy in ♀, not conspicuously excurrent in either; ♂ flowers with 5 stamens, the 5 tepals approximately equal, 2 to 2½ mm. long, the inner obtuse or emarginate, the outer obtuse or acute, with midveins excurrent; ♀ flowers usually with 1 or 2 tepals, the shorter tepal rudimentary, the longer 1 to 1½ mm. long, narrowly lanceolate, acuminate, with excurrent midvein; utricle about 1½ mm. long, indehiscent, thin or slightly fleshy, irregularly rugose, sometimes with faint ridges corresponding to the 3 style branches, often reddish; seeds ¾ to 1 mm. in diameter, round, lenticular, dark reddish brown.

The inadequate habitat data indicate that the species is a native of coastal dunes and beaches, but has become a local weed in gardens and fields near the coast.

UNITED STATES. FLORIDA (ca. 1850). Indefinite locality: *A. W. Chapman* MO, US; *A. H. Curtiss* MIN, 115 GH; *A. P. Garber* GH; *J. B. McFarlin* TEX; *J. H. Simpson* US. ALACHUA: *E. West* FLAS. BREVARD: *A. H. Curtiss* 5775 CU, FLAS, GH, ILL, ISC, KSC, MIN, MO, MSC, NEB, POM, UC, US, WIS, 5775A GH. DUVAL: *A. H. Curtiss* US. LEE: *S. M. Tracy* 7621 CU, CM, GH, ISC, MIN, MO, MSC, NEB, UC, US, WIS. MANATEE: *A. Cuthbert* FLAS; *J. B. McFarlin* 6158 MICH; *J. H. Simpson* 43 MO. MONROE: *J. L. Blodgett* GH. PINELLAS: *A. W. Chapman* MO. SARASOTA: *A. W. Chapman* GH, MO; *A. H. Curtiss* 2373 GH, MIN, US; *J. B. McFarlin* 6184 CAS, 6185 UC.

5. *AMARANTHUS TAMARISCINUS* Nutt. *Trans. Am. Phil. Soc., new ser.* 5: 165. 1837. *Montelia tamariscina* (Nutt.) A. Gray, *Man. ed. 2.* 370. 1856 (*pro parte*). *Acnida tamariscina* (Nutt.) Wood, *Am. Bot. and Fl.* 289. 1870.

Nuttall described this species as abundant on the sand beaches of the Arkansas and Grand (Neosho) rivers in what is now Oklahoma. His specimens, which I have not seen, are reported to be so immature that they show few diagnostic characters (Uline and Bray, 1895, p. 157; Gray, 1876, p. 489). However, the partial description and the locality make it reasonably certain that Nuttall was dealing with the species under consideration here. He could hardly have chosen a place closer to the heart of the range of this species, nor one more typical of its habitat.

Plants usually stout and erect, with ascending branches, 1 to 2 m. high; leaf-blade usually oblong to lance-oblong; flowering and fruiting entirely during summer and fall, mainly July through October; thyrses stiff, usually 10 to 20 cm. long, either all terminal on leafy branches or, if leafless branch thyrses present, these loosely arranged and each subtended by a leaf (by a leaf scar late in the season); bract 1½ to 2 mm. long, with moderately heavy, excurrent midrib in ♂, about 2 mm. long with heavy,

excurrent midrib in ♀; ♂ flowers with 5 stamens and 5 tepals, the inner tepals about $2\frac{1}{2}$ mm. long, obtuse or emarginate, outer tepals about 3 mm. long, acuminate, with conspicuous, excurrent midveins; ♀ flowers with 1 or 2 tepals, the shorter tepal rudimentary, the longer about 2 mm. long, narrowly lanceolate, acuminate, with moderately heavy, sometimes branched excurrent midvein; utricle about $1\frac{1}{2}$ mm. long, circumsissile, thin, rugose, sometimes with faint ridges corresponding to the 3 or 4 style branches, often reddish; seeds about 1 mm. in diameter, round, lenticular, dark reddish brown.

The species is at home on the margins of inland water bodies: river floodplains, streambanks, sandbars, muddy lakeshores, the edges of ponds, marshes. About two-thirds of all collections with habitat data are from such apparently natural sites. However, the species has very definite weedy tendencies and about one-third of the collections is from artificial habitats: roadsides, railroad rights-of-way, fields and gardens. Even in the heart of its range the species is a common weed where fields and ditches have invaded its native riverbottoms. The migrants along the margins of the main range and the isolated waifs which turn up sporadically far outside the main range are almost invariably weeds of places disturbed by man.

UNITED STATES. ALABAMA (1893). MOBILE: *C. T. Mohr* US.

ARKANSAS (1894). Indefinite locality: *B. F. Bush* 479 MO, 480 WIS. BENTON: *B. F. Bush* 15778 MO, NEB; *D. M. Moore* 29020 UARK. CHICOT: *D. Demaree* 14062 (in part) CAS, MIN, MO. FAULKNER: *F. A. Haas* 1064 US, 1065 US. INDEPENDENCE: *W. Trelease* MO. JACKSON: *D. Demaree* 20365 ISC, MO, 20368 WIS. JEFFERSON: *D. Demaree* 8768 CAS, US, 8775 MO, OC, US, 18589 MO. LAWRENCE: *P. H. Rolfs* ISC. MARION: *D. Demaree* 20602 MO. MILLER: *G. Ware* WIS. PRAIRIE: *D. Demaree* 18534 MO. PULASKI: *D. Demaree* 8325 CM, GH, MO, 8326 US, 8327 CM, 8356 DUKE, 8360 GH, WIS, 8428 CAS, MO; *G. M. Merrill* 659 DUKE, 999 UARK.

*DELAWARE (1896). NEWCASTLE: *A. Commons* GH, MO: *E. Tatnall* US.

*IDAHO (1897). PAYETTE: *L. F. Henderson* 2981 GH.

ILLINOIS (1860). Indefinite locality: *W. E. Andrews* ILL. ADAMS: *R. Brinker* 22989 ILL. CHAMPAIGN: *H. M. Franklin* ILL; *G. N. Jones* 13129 ILL, 17498 ILL. CHRISTIAN: *Winter & Sauer* 1621 WIS. CLINTON: *H. E. Ahles* 5715 ILL. COOK: *O. E. Lansing, Jr.* 2632 GH; *W. S. Moffatt* 276 ILL, 483 ILL; *W. C. Ohlendorf* OC. DOUGLAS: *G. S. Winterriger* 12 ILL, 19 ILL. GRUNDY: *G. N. Jones* 17760 ILL. KANE: *J. D. Sauer* 1600 WIS. LA SALLE: *G. D. Fuller* 3256 (in part) ILL. PIKE: *J. D. Sauer* 1619 WIS. SAINT CLAIR: *E. Douglass* MO; *H. Eggert* MO; *G. Engelmann* MO, WIS; *J. B. S. Norton* WIS. TAZEWELL: *V. H. Chase* 8589 ILL. VERMILION: *G. N. Jones* 18793 ILL.

INDIANA (1896). Indefinite locality: *E. R. Drew* UC. JOHNSON: *H. M. Clarke* IND, WIS. LAKE: *W. S. Moffatt* 468 WIS, 504 ILL. L. M. UMBACH WIS, 857 WIS, 977 US, 1553 WIS.

IOWA (1877). ADAMS: *M. J. Fay* 4315 IA, WIS. AUDUBON: *B. Shimek* IA. BOONE: *Anonymous* ISC; *L. H. Pammel* ISC, TENN. BUENA VISTA: *W. F. Couch* 103 ISC; *J. D. Sauer* 1693 WIS; *B. Shimek* IA. BUTLER: *J. D. Sauer* 1697 WIS. CALHOUN: *B. Shimek* IA. CARROLL: *M. J. Fay* 3997 IA, 4007 IA, WIS, 5346 IA. CASS: *M. J. Fay* 3436 IA. CERRO GORDO: *Pammel & McNider* 1093 ISC. CLAY: *A. Hayden* 4007 GH, ISC, MIN, MO, US, 4008 ISC, US, 7180 ISC, 7469 ISC; *B. Shimek* IA. DECATUR: *J. P. Anderson* ISC, MO, RM. DICKINSON: *H. S. Conard* TENN;

R. I. Cratty ISC; *B. Shimek* IA. *EMMET*: *F. W. Paige* ISC; *B. O. Wolden* 727 ISC. *FREMONT*: *M. J. Fay* 4132 IA, 4140 IA, WIS, 4570 IA, 4576 IA, 5554 IA. *GREENE*: *J. D. Sauer* 1677 WIS; *B. Shimek* IA. *GUTHRIE*: *M. J. Fay* 2117 IA, 4185 IA, WIS, 5326 IA. *HAMILTON*: *A. Hayden* 10329 GH, ISC; *L. H. Pammel* ISC. *HARRISON*: *M. J. Fay* 3707 IA, WIS, 3721A IA; *B. Shimek* IA. *JEFFERSON*: *McDonald & Gilly* 2122 ISC. *JOHNSON*: *M. P. Somes* 4401 ISC. *KOSSUTH*: *J. C. Blumer* 4421 ISC; *R. I. Cratty* ISC; *Pammel & Cratty* ISC. *LEE*: *J. L. Fults* 1624 (in part) ISC; *L. H. Pammel* MICH; *B. Shimek* IA. *LYON*: *L. H. Pammel* ISC; *B. Shimek* IA, ISC. *MADISON*: *Blosser & Blosser* 162 ISC; *M. J. Fay* 4999 IA. *MAHASKA*: *D. W. Augustine* 437 ISC, 465 ISC, 466 ISC. *MARSHALL*: *F. C. Stewart* ISC. *MILLS*: *M. J. Fay* 3571 IA. *O'BRIEN*: *B. Shimek* IA. *PAGE*: *M. J. Fay* 3794 IA, 4179 IA, WIS; *L. H. Pammel* ISC. *PALO ALTO*: *A. Hayden* 4009 GH, MO, 4010 ISC, 7181 ISC, 7182 ISC. *PLYMOUTH*: *M. E. Jones* POM. *POCAHONTAS*: *J. D. Sauer* 1695 WIS. *POLK*: *E. Anderson* WIS; *L. H. Pammel* ISC; *Pammel, Frankel, & Rieman* 1001 GH, ISC; *B. Shimek* IA. *POTAWATOMIE*: *W. Cleburne* NEB; *F. Eastman* 442 NEB, SAC; *B. Shimek* IA, ISC. *SCOTT*: *M. P. Somes* 3661 US. *STORY*: *C. E. Bessy* FLAS, ISC, UTC; *R. Burgess* ISC; *G. W. Carver* ISC, MO; *R. I. Cratty* ISC; *A. Hayden* 462 ISC; *D. Isely* 3932 SMU; *C. C. Lorensberry* ISC; *C. E. Maxwell* ISC; *L. H. Pammel* ISC; *J. W. Parsons* ISC; *J. D. Sauer* 1675 WIS. *TAMA*: *S. Rouse* ISC. *TAYLOR*: *M. J. Fay* 3789 IA. *VAN BUREN*: *J. Fults* ISC; *M. McDonald* 1170 ISC, 1194 ISC; *L. H. Pammel* ISC. *WAPELLO*: *L. H. Pammel* ISC. *WARREN*: *L. H. Pammel* ISC. *WEBSTER*: *D. W. Augustine* 708 ISC; *J. C. Blumer* 4454 ISC. *WINNEBAGO*: *B. Shimek* IA. *WRIGHT*: *R. B. Moorman* ISC; *B. Shimek* IA.

KANSAS (1847). Indefinite locality: *G. R. Kleeberger* CAS; *E. A. Popinoe* US. *ALLEN*: *A. S. Hitchcock* KSC. *ANDERSON*: *A. S. Hitchcock* KSC. *ATCHISON*: *A. S. Hitchcock* KSC. *BOURBON*: *A. S. Hitchcock* KSC. *BROWN*: *Clothier & Whitford* KSC. *CHASE*: *F. E. Bray* KSC. *CHAUTAUQUA*: *A. S. Hitchcock* KSC. *CHEROKEE*: *Clothier & Whitford* KSC; *A. A. Jacobs* KSC. *CLAY*: *W. A. Kellerman* KSC. *CLOUD*: *S. V. Fraser* KSC, 674 KSC. *COFFEY*: *Clothier & Whitford* KSC. *COWLEY*: *A. S. Hitchcock* KSC. *CRAWFORD*: *Clothier & Whitford* KSC. *DECATUR*: *J. D. Sauer* 1686 WIS. *DICKINSON*: *J. B. S. Norton* KSC. *DONIPHAN*: *Clothier & Whitford* KSC. *DOUGLAS*: *W. A. Kellerman* KSC; *R. L. McGregor* 562 KSC, 732 KSC; *A. M. Philips* DUKE; *W. C. Stevens* US. *EDWARDS*: *A. Finch* KSC. *ELK*: *Clothier & Whitford* KSC. *ELLSWORTH*: *M. Becker* KSC. *FRANKLIN*: *A. S. Hitchcock* KSC; *A. M. Philips* TEX. *GEARY*: *F. C. Gates* 18695 MO, 19978 KSC, NEB. *GREENWOOD*: *A. S. Hitchcock* KSC. *HARVEY*: *Clothier & Whitford* KSC. *JACKSON*: *M. Reed* KSC. *JEFFERSON*: *G. L. Clothier* KSC. *JOHNSON*: *H. L. Pellet* KSC. *KINGMAN*: *A. S. Hitchcock* KSC. *LABETTE*: *A. S. Hitchcock* KSC. *LINCOLN*: *A. S. Hitchcock* KSC. *LINN*: *A. S. Hitchcock* KSC. *LYON*: *A. M. Philips* TEX, US. *MARION*: *A. S. Hitchcock* KSC. *MARSHALL*: *A. S. Hitchcock* KSC. *MCPEHSON*: *J. E. Bodin* MIN; *A. S. Hitchcock* KSC. *MONTGOMERY*: *A. S. Hitchcock* KSC. *MORRIS*: *A. Fendler* 737 GH, MO; *A. S. Hitchcock* KSC. *NEMAHA*: *A. S. Hitchcock* KSC. *NEOSHO*: *F. Broadbent* KSC. *NESS*: *A. S. Hitchcock* KSC. *NORTON*: *J. D. Sauer* 1685 WIS. *OSAGE*: *Z. D. Brown* KSC. *OSBORNE*: *C. L. Shear* 211 (in part) NDA, RM. *POTAWATOMIE*: *F. C. Gates* 16301 KSC, MO; *H. H. Laude* MO; *Norton, Clothier & Pond* KSC. *REPUBLIC*: *D. K. Thomas* KSC. *RICE*: *A. S. Hitchcock* KSC. *RILEY*: *S. J. Adams* KSC; *W. T. Allen* US; *H. F. Bergman* NDA; *F. C. Gates* 12749 MT, 13656 OC; *A. S. Hitchcock* KSC, 349 GH; *W. A. Kellerman* KSC, MO; *J. B. S. Norton* KSC, MO, WIS, 428 GH, KSC, MO, NMC, RM, US; *D. Otis* KSC; *A. W. Staver* KSC; *J. Walquist* KSC. *RUSSELL*: *A. S. Hitchcock* KSC. *SALINE*: *J. Hancin* 617 KSC, 696 KSC, 700 KSC, 2197 MO, 2199 WIS, 2200 WIS, 2203 MO, 2205 MO, 2211 MO; *J. B. S. Norton* KSC; *M. Reed* KSC; *H. W. Ryding* 10 US. *SEDGWICK*: *T. L. Andrews* ISC; *A. S. Hitchcock* KSC; *S. F. Poole* 16 GH, 17 GH. *SHAWNEE*: *Harper & Harper* CU; *J. Lockhart* KSC; *R. B. Smyth* 1403 KSC. *SUMNER*: *Clothier & Whitford* KSC; *A. S. Hitchcock* KSC. *WABAUNSEE*: *Norton & Clothier* KSC. *WASHINGTON*: *F. E. Gwin* KSC. *WILSON*: *W. H. Haller* KSC. *WOODSON*: *Clothier & Whitford* KSC. *WYANDOTTE*: *K. K. Mackenzie* KSC.

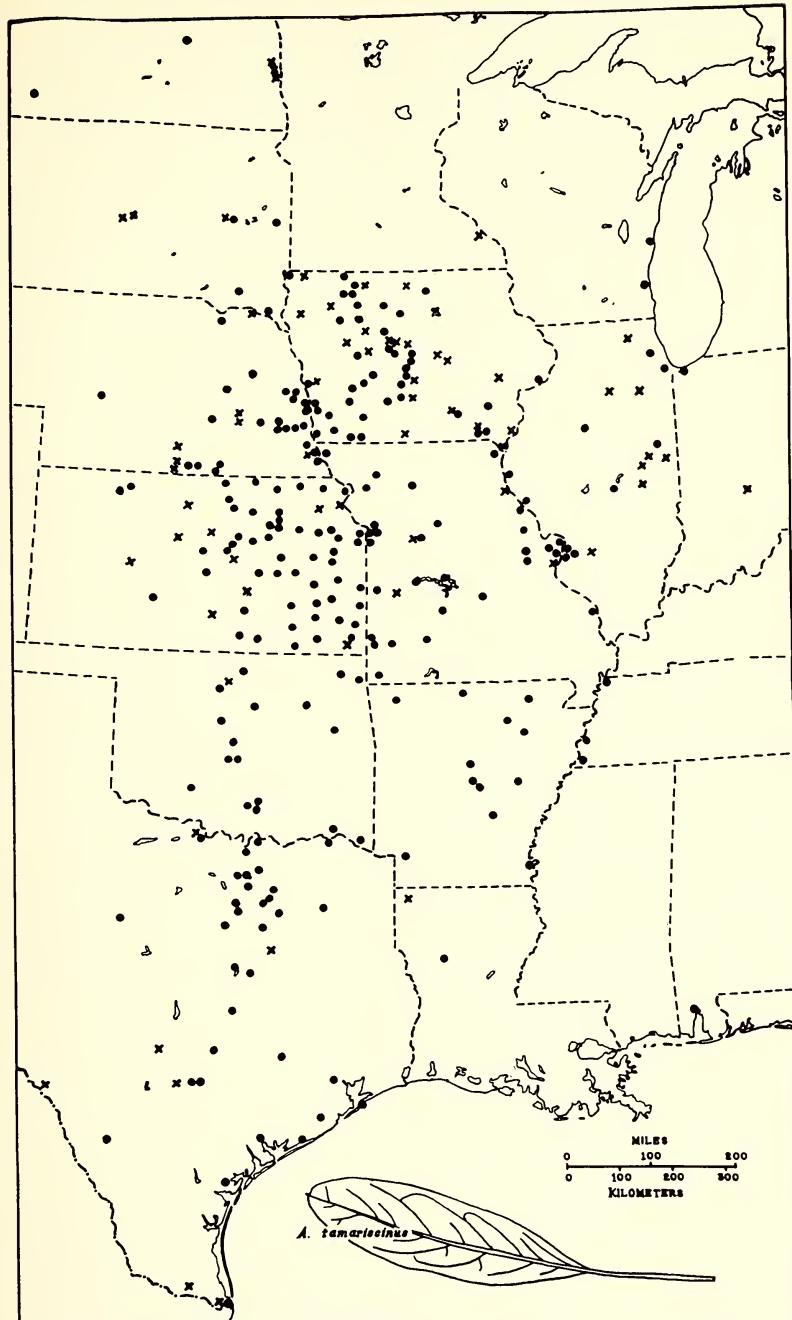


FIG. 7. *Amaranthus tamariscinus*: distribution map. Atypical plants indicated by crosses.

LOUISIANA (1952). CADDO: *G. Ware* WIS. NATCHITOCHES: *G. Ware* NO, TEX, WIS.

*MAINE (1906). PENOBSCOT: *O. W. Knight* 5257 GH, US.

*MASSACHUSETTS (1882). MIDDLESEX: *F. S. Collins* GH, MIN, MO. SUFFOLK: *C. E. Perkins* MIN.

MINNESOTA (1943). WINONA: *Moore & Neva* 16160 MIN.

MISSOURI (1841). ATCHISON: *B. F. Bush* MO. BATES: *F. P. Metcalf* 986 US. CLARK: *F. Drouet* 1723 GH; *S. B. Mead* ILL; *L. H. Pammel* ISC. DALLAS: *J. A. Steyermark* 13724 MO. DEKALB: *E. J. Palmer* 43749 MO. FRANKLIN: *J. D. Sauer* 1614 NO, WIS. GENTRY: *J. A. Steyermark* 14968 MO. GREENE: *P. C. Standley* 8652 US, 9091 US. JACKSON: *B. F. Bush* 12 US, 50 MO, 220 MO, US, 224 WIS, 227 KSC, MO, 313 GH, MO, 399 WIS, 444 MIN, MO, 446 MO, 516 MIN, MO, 1909 GH, MO, UC, US, 8175 ILL, MO, US, 8803 MO, 8845 WIS, 8878 ILL, UC, US, 13781 WIS; *F. Bush* 8 MO; *R. Hoffman* MO, WIS; *K. K. Mackenzie* ISC, KSC, MIN, RM. JASPER: *D. Demaree* 4412 UARK; *E. J. Palmer* 425 MO, 1302 MO, WIS. 1560 MO. JEFFERSON: *J. A. Steyermark* 8287 MO. LAFAYETTE: *Kluhsmann & Trusik* 36 COLO, OKL, RM, TEX; *Trusik & Busch* 11 TEX. LINCOLN: *J. D. Sauer* 1615 NO, WIS; *J. A. Steyermark* 8938 MO. LIVINGSTON: *S. Sparling* 342 ISC, 539 ISC. McDONALD: *B. F. Bush* 15773 MO, NEB. MORGAN: *J. A. Steyermark* 13154 MO. PERRY: *J. A. Steyermark* 14062 MO. PHELPS: *J. H. Kellogg* 192 MO, WIS. PIKE: *J. D. Sauer* 1617 NO, WIS. RALLS: *J. A. Steyermark* 25808 MO. SAINT CLAIR: *J. A. Steyermark* 7598 MO, 24320 MO. SAINT LOUIS: *G. Engelmann* MO; *N. M. Glatfelter* US; *J. H. Kellogg* 885 MO; *O. S. Ledman* 9 MO; *E. Mische* MO; *J. B. S. Norton* MO, WIS; *J. A. Steyermark* 513A MO, 514 MO, 8869 MO, 8901 MO, 8902 MO, 8905 WIS, 8970 WIS, 8992 MO, US, 8996 WIS, 9020 MO. SALINE: *J. A. Steyermark* 9342 MO, WIS, 9360 MO, 9361 WIS, 9375 MO, 9389 MO, US, 14811 MO. WARREN: *J. D. Sauer* 1611 WIS.

NEBRASKA (1860). Indefinite locality: *W. C. Knight* NEB, RM. CASS: *T. A. Williams* SDC, US. CEDAR: *T. A. Bruhin* GH. DODGE: *J. M. Bates* 1569 (in part) NEB; *G. C. Engberg* NEB; *W. Kiener* 17734 GH; *J. D. Sauer* 1678 WIS. DOUGLAS: *W. Cleburne* NEB; *M. R. Gilmore* MICH; *Wiegand & Castle* 825 CU. FRANKLIN: *H. Hapeman* DUKE, RM; *J. D. Sauer* 1683B WIS. HALL: *J. D. Sauer* 1679 WIS. HAMILTON: *W. Kiener* 15047 GH. KEARNEY: *H. Hapeman* OC. KNOX: *F. Clements* 2755 (in part) NEB. LANCASTER: *J. M. Bates* 4399 GH, NEB; *U. G. Cornell* NEB; *W. Kiener* 16989 GH; *J. W. Morrow* WIS; *J. L. Sheldon* WVA; *J. G. Smith* NEB; *M. P. Somes* ISC; *O. E. Sperry* NEB; *C. A. Turrell* ARIZ; *H. J. Webber* MO, NEB, 5325 NEB. LINCOLN: *F. Eastman* 1464 RM. NEMaha: *J. M. Bates* 3291 NEB; *W. W. Hansen* MICH; *J. M. Winter* 447 OC. NUCKOLLS: *G. G. Hedgecock* MO, WIS; *W. L. Tolstead* NEB. OTOE: *Anonymous* NEB; *G. G. Hedgecock* MO. PLATTE: *J. D. Sauer* 1692 WIS. POLK: *E. A. Bostrom* NEB. SARPY: *W. Cleburne* NEB. SEWARD: *W. Kiener* 17087 MO. WEBSTER: *J. M. Bates* GH, NEB, 3122 NEB, 3124 GH, NEB; *W. L. Tolstead* NEB. YORK: *W. Kiener* 17840 GH.

*NEW JERSEY (1879). HUDSON: *A. Brown* US.

*NEW MEXICO (1907). ROOSEVELT: *A. D. Stowell* NMC.

*NEW YORK (1924). TOMPKINS: *S. H. Burnham* 17854 CU, 19860 CU; *Burnham & DeFrance* 16950 CU, MO; *W. C. Muenscher* 15457 CU; *C. L. Pratt* 18521 CU.

NORTH DAKOTA (1890). CASS: *H. F. Bergman* KSC; *O. A. Stevens* CAS, NDA, OC, RM, 753 GH, MO, NDA, US; *L. R. Waldron* 1306 NDA. FOSTER: *W. P. MacDonald* NDA. SLOPE: *O. A. Stevens* NDA.

*OHIO (1871). LAKE: *H. C. Beardslee* OS.

OKLAHOMA (1874). Indefinite locality: *E. DeBarr* 286 MSC; *E. Palmer* 277 MO. CHOCTAW: *Hopkins & Cross* 2270 OKL. CLEVELAND: *W. H. Emig* 385 US; *M. Hopkins* 778 OKL, 779 OKL, 29270 OKL; *R. E. Jeffs* OKL, WIS; *Perkinson* OKL. COMANCHE: *Mrs. J. Clemens* 11560 GH, MO, OKL. CRAIG: *J. T. Monell* MO. DELAWARE: *R. Bebb* 3698 OKL; *B. F. Bush* 15788 MO. GARFIELD: *H. B. Gephhardt* 564 US, 696 OKL, 1115 US. KAY: *G. W. Stevens* 1845 GH, ILL, MIN, OKL. KINGFISHER: *R. Bollenbach* 99 OKL, 106 OKL. McCURTAIN: *U. T. Waterfall* 9829 SMU. MURRAY:

M. Hopkins 2023 OKL; *Hopkins & Demaree* 22 OKL; *Hopkins & Van Valkenburgh* 5424 OKL, 5474 OKL; *Merrill & Hagan* 821 TENN; *G. T. Robbins* 2728 OKL. *Muskogee*: *R. Bebb* 4994 GH, OKL; *E. L. Little, Jr.* 2064 OKL, 2067 OKL, 2717 OKL, 2804 OKL. *OKLAHOMA*: *D. Demaree* 13272 GH, MO, 13273 OKL; *B. Shimek* IA; *U. T. Waterfall* 3560 OKL; *S. S. White* 1148 GH, 1181 GH. *PAYNE*: *C. R. Atkins* 16 SMU; *J. W. Blankinship* GH; *K. Bradley* 20 TEX; *M. Cox* 61 MO; *J. M. Dyer* 87 ARIZ, COLO; *J. H. Kimmons* GH, MO, US; *R. E. Penn* 64 WVA; *N. R. Poteat* 61 OKL; *I. Sooter* 90 TEX; *F. A. Waugh* 162 KSC, 167 MO. *TULSA*: *R. Luckhardt* 160 OKL. *WAGONER*: *G. Ware* WIS.

**PENNSYLVANIA* (1908). *CHESTER*: *J. J. Carter* MT.

SOUTH DAKOTA (1891). *BEADLE*: *J. J. Thornber* SDC. *BROOKINGS*: *Anonymous* SDC; *M. Folds* FLAS. *CLAY*: *W. H. Over* 5137 US; *S. S. Visher* 4111 MO. *HUGHES*: *F. H. Sargent* NDA. *KINGSBURY*: *J. J. Thornber* MO, SDC, UC, WIS, WVA. *STANLEY*: *T. A. Williams* 33 US. *YANKTON*: *L. A. Bruce* 65 US.

TENNESSEE (1922). *KNOX*: *A. R. Bechtel* CU, 10868 CU. *LAKE*: *R. E. Shanks* 13693 TENN. *SHELBY*: *D. Demaree* 19675 MO, 19723 MO. *TIPTON*: *Sharp, Fairchild & Clebsch* 8067 TENN.

TEXAS (1845). Indefinite locality: *T. Drummond* 240 (in part) GH. *BELL*: *B. Mackensen* 238 MO. *BEXAR*: *F. Lindheimer* 142 GH, MIN, MO, US, WIS. *BRAZORIA*: *B. F. Bush* 1562 MO. *CAMERON*: *Bogusch & Molby* 4190 ILL; *R. Runyon* 29 US, 4245 SMU, 4246 ARIZ, SMU, TEX. *CLAY*: *V. L. Cory* 40741 GH; *L. H. Shinners* 12866 SMU, 12873 SMU. *COLLIN*: *L. H. Shinners* 11712 SMU. *COMAL*: *F. Lindheimer* MO, SMU, 285B GH, MO, 456 GH, MO. *COOKE*: *E. Whitehouse* 19262 SMU, UC, US. *DALLAS*: *H. Eggert* MO; *H. L. Graham* ISC; *M. Hynes* TEX; *G. Letterman* US, 93 WIS; *C. L. Lundell* 11653 GH, SMU; *Lundell & Lundell* 9656 GH, MICH, SMU; *J. Reverchon* GH, 829 MO, US; *L. H. Shinners* 10367 SMU; *R. Van Vleet* 334 SMU. *DENTON*: *Anonymous* TEX; *L. H. Shinners* 9395 SMU, 11894 SMU; *E. Whitehouse* 17426 SMU. *ELLIS*: *L. H. Shinners* 16727 SMU. *GALVESTON*: *G. L. Fisher* UC, WIS, 613 US, 2066 US. *GILLESPIE*: *F. Lindheimer* 54 GH, MO. *GRAYSON*: *E. Whitehouse* 17451 SMU, UC. *HARRIS*: *G. L. Fisher* WIS. *HIDALGO*: *V. L. Cory* TEX. *HOOD*: *L. H. Shinners* 19089 SMU. *JACKSON*: *B. C. Tharp* GH. *KAUFMAN*: *V. L. Cory* 52551 SMU. *LAMAR*: *G. Ware* WIS. *MATAGORDA*: *V. L. Cory* 11530 GH; *B. C. Tharp* 1593 TEX, US, 1594 TEX. *MCLENNAN*: *L. D. Smith* 235 TEX, 268 TEX; *C. L. York* 46252 TEX; *York & Smith* 149 TEX. *NAVARRO*: *J. F. Joor* MO, US. *SAN PATRICIO*: *F. B. Jones* 352 SMU. *TARRANT*: *G. W. Letterman* 100 GH, MO; *A. Ruth* 233 CM, GH, ILL, MIN, SMU, US, WIS, 710 US, 1043 CU, GH, ISC, NDA, US; *L. F. Ward* US. *TAYLOR*: *W. L. Tolstead* SMU, 7734 GH. *TRAVIS*: *A. A. Armer* 5387 TEX, US; *J. E. Bodin* 245 US; *A. M. Ferguson* 458 TEX; *R. H. Painter* 78 KSC; *B. C. Tharp* MICH, 892 TEX, US, 1276 TEX, US, 1388 TEX, US, 1501 TEX, US; *Tharp & Barkley* 15558 TEX; *M. S. Young* TEX. *VALVERDE*: *C. Wright* 582 (in part) GH, 1747 GH, US. *WASHINGTON*: *E. Brackett* GH. *WOOD*: *E. Whitehouse* 16482 SMU. *ZAVALA*: *H. R. Reed* GH.

**WASHINGTON* (1895). *KLICKITAT*: *W. N. Suksdorf* 3676 GH.

WISCONSIN (1914). *MILWAUKEE*: *H. P. Sartwell* GH. *SHEBOYGAN*: *C. Goessl* WIS.

6. *AMARANTHUS PALMERI* S. Wats. Proc. Am. Acad. 12:274. 1877.
Amaranthus Palmeri S. Wats. var. *glomeratus* Uline & Bray, Bot. Gaz. 19:272. 1894 (*pro parte*).

Watson described this species from pistillate plants and gave no definite citations of staminate specimens (syntypes: *J. L. Berlandier* 2407, banks of Rio Grande, July, 1834, GH!, here designated as lectotype; also in MO!, US!; *Dr. Edward Palmer* 323, Larkin's Station, San Diego County, California, 1875, GH!, MO!). However, in both the original description

and in a later publication Watson (1880, p. 42) suggested that certain staminate collections might represent the same species (*Edward Palmer s.n.*, 80 miles east of San Diego on Fort Yuma road, August, 1875, GH!; *L.J. Xantus 100*, Cape San Lucas, Baja California, 1859–60, GH!, US!). It is fortunate that Watson did not cite the Xantus specimen as representative of his species, because it does not belong to the same taxon as the other specimens and has served as the type of various other taxa to be discussed below. The Berlandier specimen is an ideal representative of the species under consideration here; the Palmer specimens, although well within the limits of the species, are less typical and may show traces of mixing with *A. Watsoni*. The variety *glomeratus* is based on two specimens (syntypes: *Edward Palmer 953*, caespitose form producing great mats in dry places, river bottom, Colonia Lerdo, Sonora, April 26, 1889, ♀ GH!, MICH!, US!; 958, same place and date, ♂ GH!, US!), the pistillate plants being here assigned to *A. Palmeri* and the staminate to *A. Watsoni*, although both are probably from a hybrid swarm of the two species.

Plants stout and erect with ascending branches, usually about 1 m. but occasionally 2 or 3 m. tall; leaf-blade rhomboid-lanceolate, petiole strikingly long, about equaling blade; flowering and fruiting mainly in summer and fall but occasional individuals flower in all months in the United States border states and in Mexico; thyrses flexible or moderately stiff, usually 20 to 30 cm. long, either all terminal on leafy branches or, if leafless branch thyrses present, these loosely arranged and each subtended by a leaf; bract usually 4 to 6 mm. long; midrib excurrent, moderately heavy in ♂, very heavy in ♀; ♂ flowers with 5 stamens, 5 tepals, the inner tepals $2\frac{1}{2}$ to 3 mm. long, obtuse or emarginate, the outer tepals $3\frac{1}{2}$ to 4 mm. long, acuminate, with conspicuous, long-excurrent midveins; ♀ flowers with 5 recurved tepals, each with conspicuous, branched midvein, the inner tepals usually 2 to $2\frac{1}{2}$ mm. long, spatulate, emarginate, slightly denticulate, the outer usually 3 to 4 mm. long, acute, with midvein excurrent as rigid point; utricle $1\frac{1}{2}$ to 2 mm. long, circumscissile, thin, somewhat rugose; style branches usually 2, sometimes 3; seeds 1 to $1\frac{1}{4}$ mm. in diameter, obovate, lenticular, dark reddish brown.

The species is at home along permanent or intermittent streams. About one-third of the collections bear such notations as: creek bank, river floodplain, canyon bottom, arroyo floor, edge of marsh, by spring. In such places it commonly grows in silt as well as in sandy and gravelly soil. This is probably the weediest of all the dioecious amaranths and the only one in which collections from natural habitats are outnumbered by collections from artificial habitats: irrigation ditches, roadsides, railroads, dumps, fields, and gardens. Such sites are reported for almost all collections made on the margins or outside the coherent range of the species as well as for more than half of the collections from the heart of the range. The species shares various common names with the weedy monoecious species: pigweed, careless weed, redroot in the United States, *quelite* and *bledo* in Mexico. *Amaranthus Palmeri* has been an important food plant, both as a

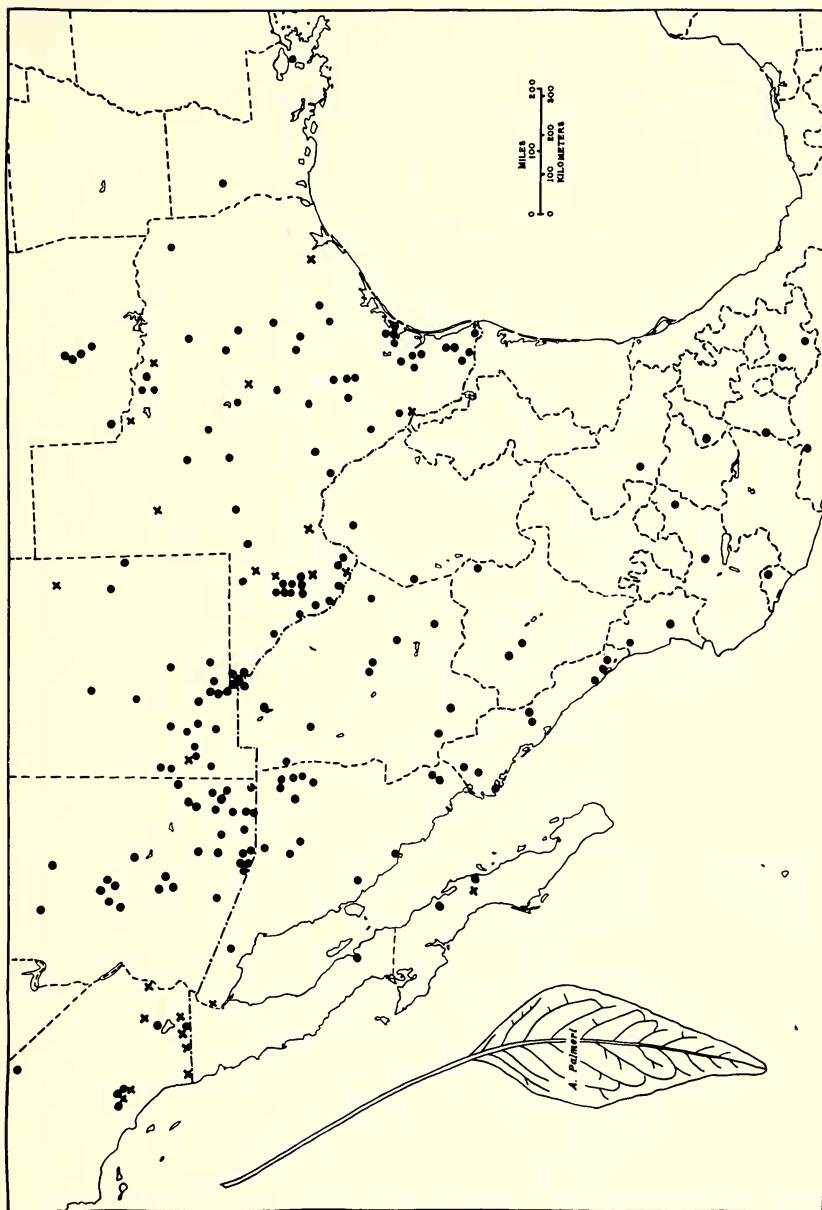


FIG. 8. *Amaranthus Palmeri*: distribution map. Atypical plants indicated by crosses.

potherb and as a source of grain, for various Indian tribes: Mojave and Chemehuevi of Arizona (*I. T. Kelly s.n.*, CAS!), Papago of Arizona (Castetter and Bell, 1942, pp. 61–62), Cocopa of Sonora (*E. Palmer s.n.*, US!; Castetter and Bell, 1951, p. 189), Tarahumare of Chihuahua (*C. V. Hartmann* 567, GH!), and others (Watson, 1889, p. 71). There is no evidence that the species has ever been systematically cultivated, although it may have been spread unintentionally by seed gathering.

MEXICO. BAJA CALIFORNIA (1887). COMONDÚ: *Carter & Kellogg* 3099 UC, WIS, 3100 UC, WIS; *B. J. Hammerly* 171 CAS, GH. ENSENADA: *E. Palmer* ARIZ, CAS, COLO, CU, FLAS, GH, ILL, KSC, MIN, MO, MSC, NEB, NMC, OC, POM, RM, SDC, TEX, UC, UTC, WIS. MULEGÉ: *H. Aschmann* WIS.

CHIHUAHUA (1885). AQUILES SERDÁN: *E. H. Wilkinson* ISC, OC, UC, US. ASCENSIÓN: *E. W. Nelson* 6420 GH, US. BATOPILAS: *C. V. Hartman* 567 GH; *E. Palmer* V GH, US. CHIHUAHUA: *E. Palmer* 203 US, 350 US; *C. G. Pringle* 1112 MIN, US. GALEANA: *J. D. Sauer* 1000 MO. JANOS: *E. A. Mearns* 320 US; *S. S. White* 1102 GH, 1113 GH, MICH, 2519 ARIZ, MICH. JIMÉNEZ: *S. S. White* 2096 MICH. JUÁREZ: *B. Shimek* IA. MANUEL BENAVIDES: *I. M. Johnston* 7972A GH. SAUCILLO: *S. S. White* 2288 GH, MICH.

COAHUILA (1940). SIERRA MOJADA: *Johnston & Muller* 1050 GH, 1252 GH.

COLIMA (1897). COLIMA: *E. Palmer* 152 US.

DURANGO (1896). SANTIAGO PAPASQUIARO: *E. Palmer* 428 GH, MO, UC, US. TEPEHUANES: *G. L. Fisher* 44234 GH. MO. TLAHUALILLO DE ZARAGOZA: *H. Pittier* 510 US.

GUERRERO (1934). COYUCA DE CATALÁN: *G. B. Hinton* 5532 GH, MO.

JALISCO (1886). GUADALAJARA: *E. Palmer* 624 GH, 627 US, 628 GH, MICH, US; *C. G. Pringle* 11314 GH, US. LAGOS DE MORENO: *C. O. Sauer* 15 MO.

MEXICO (1932). TEMASCALTEPEC: *G. B. Hinton* 2482 GH, US.

NAYARIT (1892). ACAPONETA: *J. N. Rose* 3127 US. TEPIC: *M. E. Jones* 23291 MO; *E. Palmer* US.

PUEBLA (1947). ACATLÁN: *J. D. Sauer* 1143 WIS. HUAQUECHULA: *J. D. Sauer* 1135 WIS.

QUERETARO (1913). QUERETARO: *Bros. Arsene & Agniel* 10543 US.

SAN LUIS POTOSÍ (1876). SAN LUIS POTOSÍ: *L. de la Rosa* 1010 ILL; *Parry & Palmer* 786 (in part) GH, MO, US; *J. G. Schaffner* 885 GH, 886 (in part) GH; *L. F. Ward* US.

SINALOA (1891). Indefinite locality: *J. G. Ortega* 4211 US. AHOME: *E. Palmer* 190 ARIZ, MICH, UC, US; *Rose, Standley, & Russell* 13347 US. CULIACÁN: *T. S. Brandegee* UC; *H. S. Gentry* 4939 ARIZ, MICH, MO, UC; *E. Palmer* 1721 GH, US; *Rose, Standley, & Russell* 14980 US. DEL FUERTE: *Rose, Standley, & Russell* 13416 US, 13595 US. MAZATLÁN: *Rose, Standley, & Russell* 14042A US. ROSARIO: *Ferris & Mexia* 5079 GH; *J. N. Rose* 1823 GH, US.

SONORA (1869). Indefinite locality: *C. Lumholtz* 40 GH; *E. Palmer* US. AGUA PRIETA: *S. S. White* 4107 GH. ALAMOS: *H. S. Gentry* 4851 ARIZ, GH, MICH, MO; *Rose, Standley, & Russell* 12665 US, 13031 US. BACERAC: *S. S. White* 2731 GH, MICH, 3807 GH. BAVISPE: *S. S. White* 447 GH, 762 ARIZ, GH, MICH, 2889 ARIZ, GH, MICH. CABORCA: *E. Palmer* 953 GH, MICH, US; *G. Sykes* US, 24 US. CUCURPE: *I. L. Wiggins* 7164 GH, MICH, US. GUAYMAS: *E. Palmer* US, 76 GH, 77 ARIZ, US, 78 MICH, US, 120 ARIZ, 127 GH, US, 128 US, 129 US, 130 US, 131 US, 132 US, 133 US, 134 GH, US, 688 ARIZ, GH, MICH, MO, UC, US. HERMOSILLO: *Wiggins & Rollins* 148 GH, MICH, MO, UC, US. MAGDALENA: *W. B. Kibbey* 7052 US. NACOZARI DE GARCIA: *S. S. White* 3962 GH. NOGALES: *D. Griffiths* 6753 MO.

UNITED STATES. ARIZONA (1865). Indefinite locality: *W. W. Jones* UC; *O. Loew* US; *E. Palmer* US; *C. G. Pringle* US; *C. Smart* GH, US. COCHISE: *J. C. Blumer* 1594 ARIZ, GH, ISC, KSC, MIN, MO, NEB, NMC, RM, US; *C. B. Carter* ARIZ; *O. M. Clark* 8613 ARIZ; *D. Griffiths* 1585 ARIZ; *M. E. Jones* 4224 MSC, OC, POM, US, UTC; *J. G. Lemmon* 465 GH, 2878 GH; *E. A. Mearns* 599 US, 625 US, 629 US, 664 US, 809 US, 810 US, 1096 US, 2006 US; *J. J. Thornber* ARIZ. COCONINO: *E. U. Clover* 5075 SMU; *Eastwood & Howell* 6978 CAS; *J. T. Howell* 26562 ARIZ, CAS. GILA: *J. W. Toumey* 427 US. GRAHAM: *R. H. Peebles* 14508 US; *J. T. Rothrock* 379 GH, US. GREENLEE: *A. Davidson* UC. MARICOPA: *J. B. Feudge* 2077 POM; *J. J. Thornber* ARIZ; *S. E. Wolff* 1847 US. PIMA: *J. J. Carlson* CAS; *R. Darrow* GH; *L. H. Dewey* US; *G. Engelmann* MO; *H. S. Gentry* 5963 CAS; *F. W. Gould* 2901 (in part) ARIZ; *H. W. Graham* CM; *D. Griffiths* 5897 US, 5920 US, 5927 US; *J. A. Harris* C16556 MIN; *M. E. Jones* POM; *C. D. Marsh* US; *K. F. Parker* 8053 ARIZ; *A. R. Phillips* 10 FLAG; *C. G. Pringle* CINC, CM, GH, MO; *F. Shreve* 4908 MICH; *Sister Thomas-Marie* 477 CM, RM; *J. J. Thornber* ARIZ, 201 MIN, MO, NMC, POM, UC, 2543 ARIZ; *J. W. Toumey* ARIZ, GH, UC, US; *L. C. Whitehead* ARIZ; *W. F. Wickham* IA; *I. L. Wiggins* 6992 MO, US. PINAL: *R. H. Peebles* 10011 CAS, UC, 10593 POM; *J. J. Thornber* ARIZ. SANTA CRUZ: *Darrow & Haskell* 2006 ARIZ; *D. Griffiths* 6134 MO, US; *M. E. Jones* 22639 MO; *Peebles, Harrison, & Kearney* 5578 US; *J. J. Thornber* ARIZ. YAVAPAI: *Coues & Palmer* 169 MO, 568 MO; *E. Jackson* ARIZ; *W. W. Jones* UC, 249 GH; *D. McDougal* US; *J. D. Sauer* 1661 WIS, 1662 WIS. YUMA: *A. Beard* MO; *I. T. Kelly* CAS; *Twist & Kelly* 7 GH.

CALIFORNIA (1875). Indefinite locality: *E. E. Schellenger* 84 UC. IMPERIAL: *Macbride & Drouet* 4510 KSC; *R. McKee* 13 US; *E. Palmer* GH; *S. B. Parish* 8269 GH; *C. B. Wolf* 2280 CAS, GH, POM, UC, 4336 COLO, UC. INYO: *M. F. Gilman* 4310 POM. LOS ANGELES: *L. C. Wheeler* 1355 NO, POM, 1418 UC, 2102 CAS, POM. RIVERSIDE: *H. M. Hall* 8009 UC; *L. S. Rose* 36825 CAS; *J. D. Sauer* 1668 WIS. SAN BERNARDINO: *I. M. Johnston* GH, POM, RM; *S. B. Parish* 10971 ARIZ, MIN, POM, UC; *F. M. Reed* 3683 RM, MO, UC; *J. Roos* 1895 POM. SAN DIEGO: *E. A. Mearns* 2965 US; *C. R. Orcutt* 2066 US; *E. Palmer* 323 GH, MO. *STANISLAUS: *R. F. Hoover* 697 UC.

*ILLINOIS (1896). COOK: *A. Chase* ILL.

*KANSAS (1895). WYANDOTTE: *K. K. Mackenzie* KSC, MO.

LOUISIANA (1929). NATCHITOCHES: *G. Ware* TEX, WIS. ORLEANS: *J. J. Morrison* NO, WIS.

*MISSOURI (1897). JACKSON: *B. F. Bush* 200 GH, MIN, MO, UC, US, 8798 CAS, GH, ILL, MIN, MO, RM, US, 8800 GH, ILL, POM, US, 8877 CAS, GH, ILL, MIN, US, 9213 ILL, MIN, UC, 9475 ILL, MIN; *O. C. Durham* 73 FLAS; *K. K. Mackenzie* ISC, KSC, MIN, MO.

NEW MEXICO (1881). Indefinite locality: *E. O. Wooton* 2727 US. BERNALILLO: *Rose & Fitch* 17798 US. CATRON: *E. A. Goldman* 1579 US; *E. O. Wooton* US. CURRY: *H. C. Reynolds* 276 NEB. DONA ANA: *J. H. Bruce* NMC; *D. B. Dunn* 8568 ARIZ, CAS, COLO, DUKE, FLAS, IA, IND, MT, NCU, NDA, NMC, NO, OC, SDC, TENN, UARK, WIS; *P. C. Standley* 444 MO, US; *G. R. Vasey* US; *E. O. Wooton* ARIZ, KSC, NMC, POM, RM, UC, US, 82 CAS, GH, ILL, KSC, MO, NMC, POM, RM, UC, US; *Wooton & Standley* US, 3223 MIN, RM, WIS. GRANT: *C. N. Barney* NMC; *O. B. Metcalfe* US, 719 ARIZ, MIN, MO, NMC, RM, US, 721 ARIZ, GH, MIN, MO, US; *J. G. Smith* US. HARDING: *H. M. Hanson* NMC. HIDALGO: *E. A. Mearns* 2410 US; *M. J. Murray* CU, WIS. LUNA: *D. Griffiths* 3333 US; *H. T. Henson* NMC; *M. E. Jones* POM; *A. I. Mulford* 1029 MO. OTERO: *W. C. Alsdorf* NMC; *F. G. Plummer* US. QUAY: *D. D. Suggs* NMC. SIERRA: *Mrs. W. G. Beals* 4 NMC; *E. F. Holmes* NMC; *O. B. Metcalfe* 1365 (in part) CAS, US, 1385 CAS, GH, MIN, MO, MT, POM. SOCORRO: *C. L. Herrick* 683 US; *G. R. Vasey* GH, US.

*NEW YORK (1936). QUEENS: *J. Monachino* 195 CU, TENN.

OKLAHOMA (1926). CLEVELAND: *E. L. Little, Jr.* 403 OKL. JACKSON: *M. Hopkins* 874 OKL. McCCLAIN: *M. Hopkins* 33 OKL. OKLAHOMA: *U. T. Waterfall* 1637 OKL, 1779 OKL, 2337 GH.

*PENNSYLVANIA (1933). DELAWARE: *L. C. Wheeler* 5560 GH. PHILADELPHIA: *T. O'Neill* GH.

TEXAS (1834). Indefinite locality: *J. L. Berlandier* 977 GH, 2407 GH, MO, US. ARCHER: *L. H. Shinners* 15868 SMU. ATASCOSA: *E. J. Palmer* 12920 GH, MO; *H. B. Parks* 20788 GH; *L. H. Shinners* 16917 SMU. BASTROP: *H. H. Duval* TEX; *R. Mauermann* 34 TEX. BEXAR: *C. R. Ball* 914 US; *R. D. Burr* 317 TEX; *Mrs. J. Clemens* 190 MO, POM; *H. Eggert* MO; *G. Jermy* MO; *E. H. Wilkinson* MO. BOSQUE: *L. H. Shinners* 15284 SMU. BREWSTER: *V. L. Cory* 26442 GH, 40344 GH; *L. H. Shinners* 8831 SMU; *O. E. Sperry* T875 UC, US, T879 UC, US, T1272 UC, US; *B. H. Warnock* 347 GH, 6667 SRSC, 7197 SRSC, 8024 SRSC. BROWN: *V. L. Cory* 15331 GH, 15333 GH. CAMERON: *Mrs. A. M. Davis* TEX; *L. H. Shinners* 17760 SMU. CLAY: *L. H. Shinners* 12860 SMU. COKE: *V. L. Cory* 37955 GH. COLORADO: *B. Mackensen* 208 MO. DIMMIT: *V. L. Cory* 29319 GH; *S. S. Ivanoff* 29291 GH; *L. H. Shinners* 17313 SMU, 17314 SMU. EDWARDS: *V. L. Cory* 5245 GH, 38113 GH, 52493 RM, SMU, UC. EL PASO: *B. Barlow* UC; *Mrs. J. Clemens* POM; *M. E. Jones* POM; *E. A. Mearns* 1503 US; *B. Shimek* IA; *G. R. Vasey* US; *B. H. Warnock* 7277 SRSC, 8192 SMU, SRSC. FISHER: *J. Brookes* 41 TEX. HARRIS: *G. L. Fisher* 276 ILL, US. HIDALGO: *Ferris & Duncan* 3067 CAS, MO; *M. E. Jones* MO; *Lundell & Lundell* 13337 SMU; *L. H. Shinners* 17153 SMU, 17169 SMU, 17897 SMU. HUDSPETH: *V. L. Cory* 1488 GH; *U. T. Waterfall* 6276 MO. JEFF DAVIS: *F. Barkley* 14T7798 TEX; *V. L. Cory* 9397 GH, 17639 GH; *L. C. Hinckley* TEX; *B. H. Warnock* 6940 SRSC, 7953 SRSC, 9228 SMU, SRSC; *M. S. Young* ILL, TEX, UC. JIM WELLS: *R. Freeborn* 438 TEX. KAUFMAN: *L. H. Shinners* 15968 SMU. KERR: *A. A. Heller* 1890 ARIZ, CAS, CU, GH, IA, ILL, ISC, MICH, MIN, MO, MSC, RM, UC, US. KLEBERG: *V. L. Cory* 51319 SMU, TEX; *L. H. Shinners* 17021 SMU, 17068 SMU; *J. F. Sinclair* GH, TEX. LA SALLE: *L. H. Shinners* 17280 SMU. LAVACA: *G. L. Fisher* 117 US. LIVE OAK: *L. H. Shinners* 17000 SMU. LLANO: *E. Whitehouse* TEX. LOVING: *B. H. Warnock* 10676 SMU. LUBBOCK: *E. L. Reed* 1658 US. MCLENNAN: *L. D. Smith* 315 TEX, 825 TEX. MEDINA: *V. L. Cory* 11676 GH. MIDLAND: *V. L. Cory* 40596 TEX, 40597 GH. MILAM: *L. H. Shinners* 14729 SMU. MILLS: *V. L. Cory* 58207 SMU, 58208 SMU; *L. H. Shinners* 16837 SMU. MONTAGUE: *L. H. Shinners* 12832 SMU. MORRIS: *V. L. Cory* 56911 SMU. NUECES: *V. L. Cory* 20486 GH. PRESIDIO: *W. W. Eggleston* 17295 US; *L. C. Hinckley* ARIZ, GH, 2047 GH, TEX; *T. H. Rogers* SRSC; *B. H. Warnock* 94 TEX, US, 47830 SRSC; *Watts & Finger* SRSC. REEVES: *V. L. Cory* 52239 SMU; *Rose & Fitch* 17896 US. REFUGIO: *E. R. Bogusch* OC. SAN PATRICIO: *F. B. Jones* 377 SMU; *Tharp & Brown* 48199 TEX. TARRANT: *A. Ruth* 158 MICH, 967 (in part) CU, GH, ISC, MSC, SMU, US, WIS; *E. Whitehouse* 16254 SMU. TAYLOR: *W. L. Tolstead* 7702 GH, SMU. TERRELL: *W. B. Crockatt* 50 NMC. TRAVIS: *B. C. Tharp* CM, GH, MO, UC, 707 US, 1530 TEX, US, 1535 TEX, US, 1962 US; *B. H. Warnock* 66 TEX; *M. S. Young* TEX. VALVERDE: *H. Eggert* GH, MO. WARD: *B. C. Tharp* 3389 (in part) TEX. WEBB: *V. L. Cory* 16872 GH; *C. R. Orcutt* 5720 MO; *L. H. Shinners* 17225 SMU. WICHITA: *L. H. Shinners* 15855 SMU. WILBARGER: *E. Whitehouse* 10945 (in part) SMU. WILLACY: *V. L. Cory* 51467 GH, SMU; *R. Runyon* 2846 UC, US; *L. H. Shinners* 17113 SMU.

7. *AMARANTHUS WATSONI* Standl. Bull. Torrey Club 41:505. 1914. *Amblogyne Torreyi* A. Gray, Proc. Am. Acad. 5:167. 1861. (*pro parte*). *Amaranthus Torreyi* (A. Gray) Benth. ex S. Wats. Bot. Calif. 2:42. 1880. (*pro parte*). *Amaranthus Torreyi* (A. Gray) Benth. ex S. Wats. var. *suffruticosus* Uline & Bray, Bot. Gaz. 19:272. 1894. *Amaranthus Palmeri* S. Wats. var. *glomeratus* Uline & Bray, loc. cit. 272. 1894. (*pro parte*).

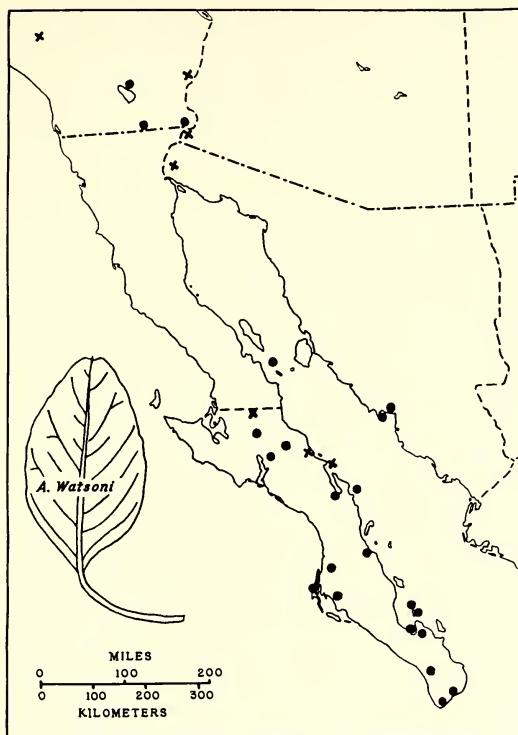


FIG. 9. *Amaranthus Watsoni*: distribution map. Atypical plants indicated by crosses.

Amblogyne Torreyi was described from a very discordant group of specimens (syntypes: *J. M. Bigelow*, Mex. Bound. Surv. 1190, mountains of the Cibola, a tributary of the Rio Grande, W. Texas, August, 1852, US!; *C. C. Parry s.n.*, "Camp Green, New Mexico," place unlocated; *L. J. Xantus* 100, Cape San Lucas, Baja California, 1859-60, ♂ ♀ GH! ♂ US!). Gray cited another collection (*H. Engelmann s.n.*, Lt. Bryan's Expedition, South Fork of Platte, September, 1856, ♀ GH! MO!) as representing a variety of the species; one sheet was inscribed *A. Torreyi angustifolia*, but this name has not been published. Although Gray described the species as dioecious, the Bigelow and Parry specimens are not; Uline and Bray quite properly split them off as the types of a new monoecious species, *Amaranthus Bigelovii*, and a variety of the same, neither of which taxa concern us here. Only the Xantus collection belongs to the species now under consideration; the Engelmann collection belongs to the next species below. Uline and Bray effected a taxonomic separation of these two collections by splitting off a new variety under the misnomer *suffruticosus*, with the Xantus specimen as its type, thus leaving only the Engelmann collection in *A. Torreyi* proper. Unfortunately this procedure violated the rules, as Johnston has pointed out (1944, p. 155; 1948, p.

193), since the element best fitting the original description was removed from the species. Johnston has proposed that the name *A. Torreyi* be reinstated for the monoecious species which has generally been called *A. Bigelovii*; one alternative would be to reinstate the name *A. Torreyi* for the species now being considered. Neither of these alternatives provides a happy solution, since for fifty years the name *A. Torreyi* has been universally applied to the next species treated, which includes the Engelmann specimen. I believe the best escape from this miasma is by discarding the name *A. Torreyi* completely as a *nomen ambiguum*, potentially a source of continued confusion and error. The earliest available name for the present species then becomes *A. Watsoni* (syntypes: *Edward Palmer* 312, on a sand spit near Guaymas, Sonora, October, 1887, ♀ US!, here designated as lectotype; also ♂ ♀ in GH!; *Edward Palmer* 675, same area and year, ♂ US!; paratypes: *Edward Palmer* 676, same area and year, ♀ US!; *Nelson & Goldman* 7282, Santo Domingo to Matancito, Baja California, altitude 50 to 100 ft., November 14-15, 1905, ♂ US!; *Nelson & Goldman* 7532, La Paz, Baja California, altitude 0 to 20 ft., February 17, 1906, ♂ US!; and once again the well-worn *Xantus* 100.

Plants moderately stout, low and bushy, with many ascending branches, or erect, to 1 m. tall; leaf-blades ovate to oblong, often deeply retuse, sometimes coriaceous; two flowering and fruiting seasons: plants which grow with winter rainy season mature in spring, those which grow with summer rains mature in fall; thyrses often extremely thick, flexible or fairly rigid, usually 10 to 20 cm. long, either all terminal on leafy branches or a few loosely arranged leafless branch thyrses present, the uppermost of these not subtended by leaves; bract usually $2\frac{1}{2}$ to $3\frac{1}{2}$ mm. long, with distinctive glandular pubescence on outer side, the midrib excurrent, moderately heavy in ♂, heavy in ♀; ♂ flowers with 5 stamens, 5 tepals, the inner tepals $2\frac{1}{2}$ to 3 mm. long, obtuse or emarginate, the outer tepals 3 to $3\frac{1}{2}$ mm. long, acute, all tepals apiculate but dark midveins not excurrent; ♀ flowers with 5 strongly recurved approximately equal tepals, all tepals usually about $2\frac{1}{2}$ mm. long, broadly spatulate and emarginate, with heavy, conspicuously branched, scarcely excurrent midveins; utricle about $1\frac{1}{2}$ mm. long, circumscissile, thin, somewhat rugose; style branches usually 2, sometimes 3; seeds $\frac{3}{4}$ to $1\frac{1}{4}$ mm. in diameter, round or slightly obovate, lenticular, dark reddish brown.

The species is at home in coastal dunes, on beaches and sandspits, and other places near the sea. It is the most abundant annual on some of the low desert islands of the Gulf of California, growing on guano-impregnated and weakly saline flats (Johnston, 1924, p. 1018; also his notes on specimens in CAS, cited below). Inland, the species stays close to watercourses and is common on the sandy floors of ravines and arroyos. The Colorado River and the associated irrigation works have apparently provided the pathway by which this species, often mixed with *A. Palmeri*, has moved into southern California as a weed of irrigated fields and citrus groves.

Like *A. Palmeri*, with which it is probably confused in some of the ethnobotanical literature, this species has served as an Indian food plant. Eighteenth century accounts of the Indians of central Baja California report that bushels of seed from wild *bledos* were harvested in both spring and fall (Aschmann, 1953). The name, the region, and the kinds of sites mentioned all suggest that these plants were involved.

MEXICO. BAJA CALIFORNIA (1860). COMONDU: *T. S. Brandegee* UC, US; *T. Crocker* CAS; *Nelson & Goldman* 7282 US; *C. R. Orcutt* 32 US; *P. J. Rempel* 135 ARIZ. ENSENADA: *Carter, Alexander, & Kellogg* 1930 UC, 1931 UC; *I. M. Johnston* 3527 CAS. LA PAZ: *T. S. Brandegee* UC; *A. Carter* 2717 UC, 2727 UC; *I. M. Johnston* 3032 CAS, 3225 CAS, GH, MO, UC, US; *M. E. Jones* 24452 MO; *Nelson & Goldman* 7532 US. MULEGÉ: *H. Aschmann* WIS; *H. S. Gentry* 4065 MO, UC, 7831 UC, 7831A UC; *I. M. Johnston* 3652 CAS, 3743 CAS; *E. Palmer* 147 CAS, GH, US; *I. L. Wiggins* 7865 GH, MICH, UC, US. SAN JOSE DEL CABO: *T. S. Brandegee* 492 UC, US; *L. J. Xantus* 100 GH, US. TODOS SANTOS: *B. J. Hammerly* 292 CAS, US.

SONORA (1887). CABORCA: *E. Palmer* 958 GH, US. EMPALME: *T. D. Mallery* ARIZ. GUAYMAS: *H. S. Gentry* 4686 ARIZ, CAS, MICH, MO, UC, US; *E. Palmer* 311½ ARIZ, GH, US, 312 GH, US, 675 US, 676 US; *I. L. Wiggins* 6356 MICH, POM, US, 6357 US.

UNITED STATES. ARIZONA (1912). YUMA: *J. J. Thornber* ARIZ. CALIFORNIA (1901). IMPERIAL: *L. Abrams* 3993 GH, MO, POM; *T. S. Brandegee* UC; *M. E. Jones* POM. LOS ANGELES: *L. C. Wheeler* 963 POM, UC. RIVERSIDE: *T. S. Brandegee* UC; *J. D. Sauer* 1667 WIS.

8. AMARANTHUS ARENICOLA I. M. Johnston, Jour. Arnold Arb. 29:193. 1948. *Amblogyne Torreyi* A. Gray, Proc. Am. Acad. 5:167. 1861 (*pro parte*). *Amaranthus Torreyi* (A. Gray) Benth. ex S. Wats. Bot. Calif. 2:42. 1880 (*pro parte*).

By a comedy of errors, presented briefly in the discussion of the preceding species, the name *A. Torreyi* has been incorrectly but almost universally applied to the present species. As a result this common and well-known species had no scientific name of its own until 1948, when Johnston named it *A. arenicola* (holotype: *A. S. Hitchcock* 4284, sandhills, Hamilton County, Kansas, 1895, ♀ GH!; isotypes: ♀ KSC! NMC! RM! US! ♂ MO!).

Plants stout and erect, commonly 2 m. tall; leaf-blade usually oblong; flowering and fruiting entirely in summer and fall, mostly July through September; thyrses often thick, flexible, usually 10 to 20 cm. long, either all terminal on leafy branches or, if a few leafless branch thyrses present, these loosely arranged and each subtended by a leaf; bract usually 1½ to 2½ mm. long, the midrib scarcely excurrent, heavy in ♂, extremely heavy in ♀; ♂ flowers with 5 stamens, 5 approximately equal tepals, the tepals usually about 3 mm. long, inner emarginate or obtuse, outer obtuse or acute, all apiculate but dark midveins not excurrent; ♀ flowers with 5 recurved spatulate tepals, each with conspicuous, usually branched mid-vein, the inner tepals 1½ to 2 mm. long, emarginate or obtuse, the outer tepals 2 to 2½ mm. long, obtuse, apiculate; utricle about 1½ mm. long,

circumscissile, thin, fairly smooth; style branches usually 3; seed 1 to $1\frac{1}{4}$ mm. in diameter, round, lenticular, dark reddish brown.

Johnston's name is well chosen; the plants seem to be very much at home in the sandhills. There and elsewhere the species is most abundant in such places as swales, dried ponds, lakeshores, river sandbars, edges of saline marshes, margins of hot springs. Most of the records are from sandy soil, but a few are from heavy silt or clay. The species is moderately successful as a weed. Almost half of the collections, including almost all those from isolated places outside the coherent range, were made in artificially disturbed habitats; fields, roadsides, railroad rights-of-way.

UNITED STATES. COLORADO (1861). Indefinite locality: *G. R. Kleeberger* CAS; *G. R. Vasey* 509 CINC, GH, MO. ADAMS: *J. A. Ewan* 13968 COLO, NO; *E. L. Johnston* 275A MO; *G. T. Robbins* 853 UC. BACA: *Weber & Anderson* 5190 COLO, UC. BOULDER: *J. A. Ewan* 12254 CAS, NO, UC; *W. A. Weber* COLO. CHAFFEE: *E. Harper* 167 WIS. CLEAR CREEK: *C. C. Parry* 323 GH, MO. DENVER: *A. Eastwood* COLO; *W. Heustis* COLO; *M. E. Jones* 579 POM, UTC; *J. H. Smith* 2038 US. EL PASO: *R. Bacigalupi* 904 GH, UC. FREMONT: *T. S. Brandegee* 477 MO, UC, US, 846 MO, UC; *G. Engelmann* MO; *G. Osterhout* 3336 RM. LAS ANIMAS: *C. M. Rogers* 5049 COLO, TEX, 5050 COLO, TEX. LINCOLN: *E. O. Wooton* US. LOGAN: *G. E. Osterhout* 1141 RM. MORGAN: *G. Osterhout* 7729 POM, RM; *F. Ramaley* 16388 ARIZ, CAS, COLO, OKL, TEX, UC, UTC. WASHINGTON: *Ramaley & Ewan* 16320 COLO. WELD: *J. Ewan* 12291 NO, WIS, 13988 COLO, NO, 14098 COLO, NO; *E. L. Johnston* 275 GH, US, 275B GH, MO, US, 277A US; *E. J. Kraus* WIS; *F. Ramaley* 12368 COLO, 12386 COLO, 12560 (in part) COLO; *Ramaley & Ewan* 16319A NO; *L. F. Ward* US. YUMA: *Anonymous* MIN, MO, WIS; *G. E. Osterhout* 4047 RM, WIS.

*DISTRICT OF COLUMBIA (1896). *E. S. Steele* MO.

*ILLINOIS (1898). COOK: *L. M. Umbach* WIS. CRAWFORD: *H. E. Ahles* 4963 ILL.

*INDIANA (1896). LAKE: *W. S. Moffatt* 493 ILL; *L. M. Umbach* 388 TENN, 1419 WIS.

*IOWA (1895). LEE: *B. Shimek* TEX. MUSCATINE: *F. Reppert* IA.

KANSAS (1876). Indefinite locality: *A. S. Hitchcock* 609 GH; *L. G. Hoysradt* US. BARTON: *A. S. Hitchcock* KSC; *P. P. Lorimer* KSC. CHEYENNE: *A. S. Hitchcock* KSC. COMANCHE: *A. S. Hitchcock* KSC. DICKINSON: *A. S. Hitchcock* KSC. EDWARDS: *A. Finch* KSC; *A. S. Hitchcock* KSC. ELLSWORTH: *C. Weber* 5 MO. FINNEY: *R. Fritz* 45 KSC; *R. P. Murphy* KSC; *Rydberg & Imler* 995 KSC; *E. O. Wooton* US. FORD: *F. C. Gates* 15974 KSC. GRANT: *A. S. Hitchcock* KSC. GRAY: *A. S. Hitchcock* KSC. HAMILTON: *A. S. Hitchcock* 428A GH, KSC, MO, NMC, RM, US. HASKELL: *A. S. Hitchcock* KSC. HODGEMAN: *A. S. Hitchcock* KSC. KEARNY: *A. S. Hitchcock* KSC; *Rydberg & Imler* 928 MO. KIOWA: *A. S. Hitchcock* KSC; *F. Rinkel* GH, DUKE, TEX, US. MEADE: *A. S. Hitchcock* KSC. MORTON: *Bloodhart & Poorman* 9 KSC; *A. S. Hitchcock* KSC. OSBORNE: *C. L. Shear* 180 MO, 211 (in part) GH, NEB, US, 213 GH, NEB, US. PAWNEE: *A. S. Hitchcock* KSC. PRATT: *A. S. Hitchcock* KSC. RENO: *A. S. Hitchcock* KSC. ROOKS: *E. Bartholomew* KSC, US. SEWARD: *W. A. Kellerman* KSC; *Rydberg & Imler* 846 COLO, KSC, UC. SHERIDAN: *C. Weber* 17 KSC. STAFFORD: *A. S. Hitchcock* KSC; *E. Maupin* KSC. STANTON: *A. S. Hitchcock* KSC. STEVENS: *A. S. Hitchcock* KSC.

*MICHIGAN (1920). LENAWEE: *C. Billington* US. WAYNE: *O. A. Farwell* 5149 US.

MISSOURI (1895). JACKSON: *B. F. Bush* 518 CAS, MIN, MO; *O. C. Durham* 11232 ILL, MO.

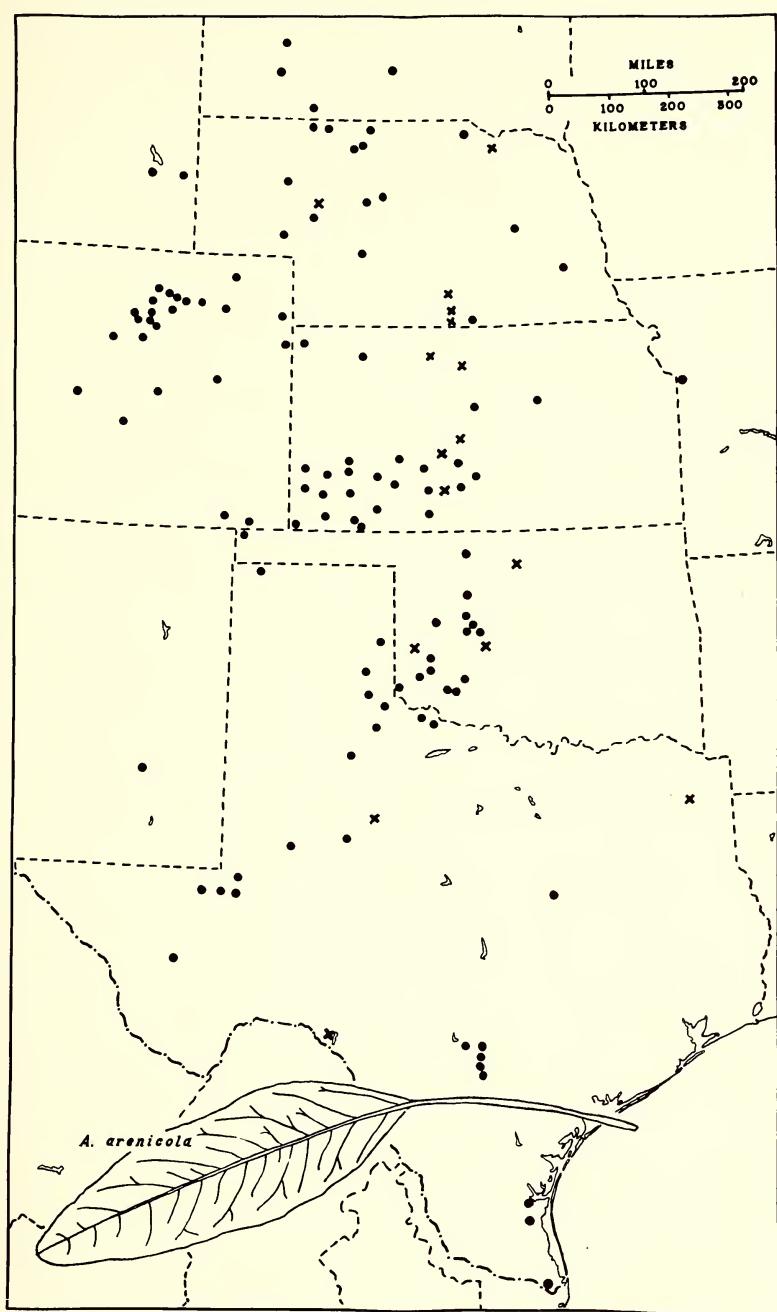


FIG. 10. *Amaranthus arenicola*: distribution map. Atypical plants indicated by crosses.

NEBRASKA (1856). Indefinite locality: *H. Engelmann* GH, MO; *F. V. Hayden* GH; *G. R. Vasey* US. ARTHUR: *W. Kiener* 15417 GH. CHERRY: *E. Anderson* SDC, WIS; *J. M. Bates* GH, MIN, NEB, 5223 GH, MIN, NEB, 5315 NEB, 5323 MIN, NEB, 5334 NEB; *M. Dworak* NEB; *W. L. Tolstead* 609 GH. FRANKLIN: *J. Ewan* 14797 COLO, NO; *H. Hapeman* CM, UC; *J. D. Sauer* 1683A WIS. GARDEN: *C. H. Churchill* NEB; *H. Engelmann* MO. GRANT: *Rydberg & Tulen* 1664 CU, 1674 (in part) SDC. HOLT: *Engelman, Hodges, & Nielsen* 3486 MIN. KEARNEY: *H. Hapeman* NO, POM, RM. KNOX: *F. Clements* 2755 (in part) CU, GH, MIN, US. LANCASTER: *J. L. Sheldon* WVA. LINCOLN: *W. Kiener* 17310 GH; *J. D. Sauer* 1691 WIS. PLATTE: *K. M. Wiegand* 826 CU. SHERIDAN: *F. Sandoz* 111 NEB, 112 NEB, 113 NEB, 114 NEB. THOMAS: *J. C. Blumer* ISC; *Pool & Folsom* NEB; *Poor & Williams* NEB; *Rydberg & Tulen* 1370 NEB, SDC, 1513 NEB, US. WEBSTER: *J. M. Bates* NEB.

*NEW JERSEY (1930). BURLINGTON: *W. H. Witte* RM. CAMDEN: *W. H. Witte* ARIZ. GLOUCESTER: *S. F. Blake* 11260 GH, US.

NEW MEXICO (1903). CHAVES: *D. Griffiths* 5702 US.

OKLAHOMA (1853). Indefinite locality: *G. W. Stevens* 804 OKL. BECKHAM: *B. Osborn* 1348R OKL. BLAINE: *G. W. Stevens* 857½ GH, OKL. CADDO: *J. M. Bigelow* US; *M. Hopkins* 2132 OKL. CIMARRON: *D. Demaree* 13306 GH, MIN, OKL. COMANCHE: *F. B. McMurry* 529 OKL. CUSTER: *L. Mericle* 408 OKL, 720 OKL, 949 OKL, 1032 OKL; *G. W. Stevens* 916 GH, OKL. GARFIELD: *H. B. Gephhardt* 563 US. GREER: *R. Bull* 221 OKL; *G. W. Stevens* 1039 GH, ILL, MIN, MO, OKL, US. HARMON: *M. Hopkins* 1071 OKL, 1072 OKL. KIOWA: *M. Hopkins* 854 OKL; *G. W. Stevens* 1190 GH, MIN, OKL. WASHITA: *C. T. Eskew* 1498 OKL. WOODS: *G. W. Stevens* 1702 GH, ILL, MIN, MO, OKL, US.

*PENNSYLVANIA (1941). DELAWARE: *L. C. Wheeler* 5563 GH.

SOUTH DAKOTA (1889). BENNETT: *J. W. Moore* 843 MIN. LYMAN: *T. A. Williams* 143 CAS. PENNINGTON: *W. H. Over* 2384 US. WASHINGTON: *W. H. Over* 2410 US.

TEXAS (1859). Indefinite locality: *V. Havard* US; *G. C. Neally* GH, US; *J. Reverchon* MO. ATASCOSA: *V. L. Cory* 11677 GH, 19152 GH. BEXAR: *B. Mackensen* 219 MO; *H. B. Parks* 27084 GH. CAMERON: *I. Shiller* 915 TEX. CHILDRESS: *Anonymous* TEX. COLLINGSWORTH: *V. L. Cory* 16127 GH. COTTLE: *V. L. Cory* 35272 GH. DALLAM: *V. L. Cory* 35418 GH. DICKENS: *V. L. Cory* 16004 GH. FISHER: *E. Whitehouse* 16737 MIN, SMU. HALL: *J. Reverchon* MO; *E. Whitehouse* 10743 SMU, UC. HARDEMAN: *C. R. Ball* 965 US. JEFF DAVIS: *V. L. Cory* 40520 GH. KENEDY: *V. L. Cory* 17036 GH; *R. Runyon* 2847 US, 3582 US; *L. H. Shinners* 17803 SMU, 17090 SMU. LOVING: *B. H. Warnock* 10693 SMU. MARTIN: *V. L. Cory* 40947 TEX. McLENNAN: *L. D. Smith* 1045 TEX. MEDINA: *E. Palmer* 1131 GH, MO, US. MITCHELL: *R. W. Pohl* 4328 ISC, SMU. MORRIS: *V. L. Cory* 56912 SMU. VAL VERDE: *Parry & Bigelow* 1195 US; *L. H. Shinners* 17347 SMU. WARD: *B. C. Tharp* 3389 (in part) TEX, US; *Turner & Warnock* 60 SMU, SRSC; *B. H. Warnock* 9029 SRSC, 9036 SMU, SRSC; *Warnock & Parks* 8823 SRSC. WHEELER: *V. L. Cory* 35311 GH. WILBARGER: *E. Eggert* MO, WIS. WINKLER: *L. C. Hinckley* 4518 SRSC.

*VIRGINIA (1939). DINWIDDIE: *Fernald & Long* 10633 CU, DUKE, GH, MO, US.

WYOMING (1889). GOSHEN: *Brenckle & Stevens* 39022 NDA. PLATTE: *A. Nelson* 8581 CU, MO. *SWEETWATER: *W. Cleburne* NEB.

9. *AMARANTHUS GREGGII* S. Wats. Proc. Am. Acad. 12: 274. 1877. *Amaranthus Greggii* S. Wats. var. *Muelleri* Uline & Bray, Bot. Gaz. 19: 272. 1894. *Amaranthus myrianthus* Standl. Bull. Torrey Club 41: 506. 1914. *Amaranthus annectens* Blake, Jour. Bot. 53: 103. 1915.

Watson described this species from a single collection, entirely of pistillate plants (*J. Gregg* s.n.), frequent near the mouth of the Rio Grande,

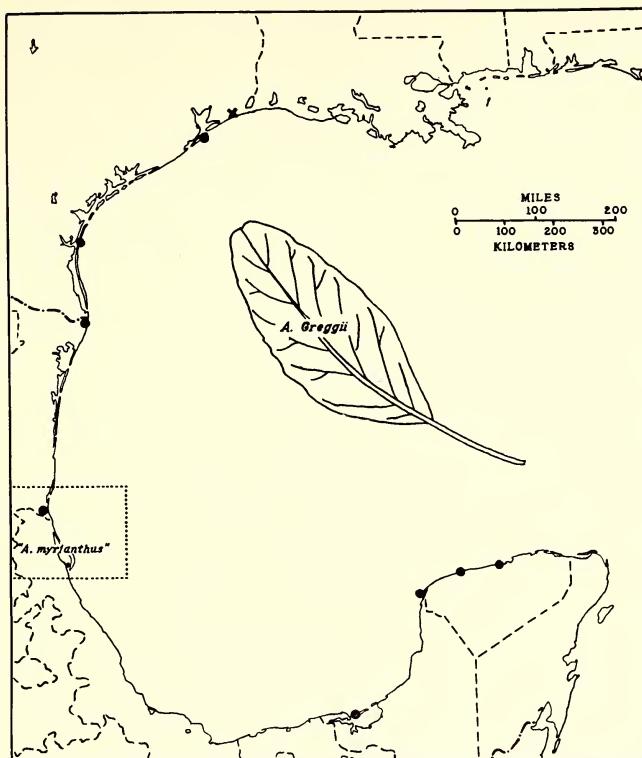


FIG. 11. *Amaranthus Greggii*: distribution map. Atypical plants indicated by crosses.

Tamaulipas, December 17, 1847, GH!, here designated as lectotype; also MO!). Uline and Bray knew but one additional collection, also pistillate (*F. Mueller s.n.*, near Vera Cruz, 1853), from which they described a new variety. They mentioned no concrete differences between the species proper and the variety and added the curious statement that the two are "inseparable." Standley described *A. myrianthus* to include this variety but based it on a different type (holotype: *Edward Palmer 266*, sea level, vicinity of La Barra, 8 km. east of Tampico, Tamaulipas, February 1-8, 1910, ♀ US!; isotypes: ♀ GH! MO! US! WIS!). The proper taxonomic disposition of this collection and one similar to it (*Edward Palmer 511*, same area and year) is not easy to determine. The living plants were badly injured by insects and had become half monstrous, with larvae instead of seeds in most of the utricles. These miserable plants appear to be morphologically intermediate between *A. Greggii* and *A. arenicola*, and are conceivably hybrids between those species. Blake described his species from a single collection (holotype: *A. Schott 360*, seashore, Celestun, Yucatan, May 12, 1868, ♀ BM, fragment US!; isotype: ♂ ♀ GH!), which shows some quantitative differences from the type of *A. Greggii*.

However, when all available specimens are assembled, there is no apparent discontinuity between the two forms.

Plants stout, sprawling or erect, to 1 m. tall; leaf-blade strikingly thick and coriaceous with prominent nerves beneath, usually oblong but quite variable in shape; flowering and fruiting during summer and fall in northern colonies, during all seasons in tropics; thyrses thick, flexible, 5 to 15 cm. long, either all terminal on leafy branches or, if a few leafless branch thyrses present, each subtended by a leaf; bract 1½ to 2½ mm. long, the midrib scarcely excurrent, heavy in ♂, very heavy in ♀; ♂ flowers with 5 stamens, 5 approximately equal tepals, the tepals usually 2½ to 3 mm. long, the inner emarginate or obtuse, outer obtuse or acute, all apiculate but dark midveins not excurrent; ♀ flowers with 5 recurved, approximately equal tepals which are usually 2½ to 3 mm. long, the inner spatulate and emarginate, the outer obovate-oblong and obtuse, all with heavy, conspicuously branched, scarcely excurrent midveins; utricle about 3 mm. long, indehiscent, somewhat fleshy, fairly smooth; style branches usually 3; seed 1¼ to 1¾ mm. long, obovoid, lenticular, dark brown.

The dozen collections with habitat data are all from coastal sand dunes or from sea beaches.

MEXICO. CAMPECHE (1933). CARMEN: *C. D. Mell* 2015 US.

TAMAULIPAS (1847). MATAMOROS: *J. Gregg* GH, MO; *R. Runyon* 475 US. TAMPICO: *E. Palmer* 266 GH, MO, US, WIS, 511 GH, MO, US.

YUCATAN (1868). CELESTUN: *A. Schott* 360 GH, US. DZILAM GONZALEZ: *G. F. Gaumer* 1243 GH, MO, US. PROGRESO: *R. L. Crockett* 69 US; *Lundell & Lundell* 8061 US; *W. C. Steere* 3112 MICH.

UNITED STATES. TEXAS (1902). GALVESTON: *G. L. Fisher* 102 MO, MT, US, 303 US, 605 GH, MT, RM, US, 612 GH, US; *F. C. Gates* 19217 KSC; *L. H. Pammel* ISC; *J. Reverchon* 2940 MIN, MO. WIS. JEFFERSON: *B. C. Tharp* 3131 US. KLEBERG: *B. C. Tharp* TEX.

10. ***Amaranthus Acanthochiton*** (Torr.) stat. nov. *Acanthochiton Wrightii* Torr. in Sitgr. Rep. Exp. 170. 1853. Non *Amaranthus Wrightii* S. Wats. Proc. Am. Acad. 12: 275. 1877.

The monotypic genus *Acanthochiton* was described from two early collections (syntypes: *S. W. Woodhouse s.n.*, Sitgreaves expedition, Zuñi Pueblo, September, 1851, ♂ ♀ GH!, the ♀ here designated as lectotype; *C. Wright* 1167, Rio Grande Valley, about 50 miles below El Paso, September 6, 1849, ♀ GH! US!). Since the epithet *Wrightii* cannot be retained when this taxon is assigned to *Amaranthus*, another name must be chosen. To maintain a continuity in names, *Acanthochiton* is herein given specific rank.

Plants stout and erect, usually about ½ m. tall, with many ascending branches; leaf-blade narrowly lanceolate to linear, the nerves prominent beneath, the margin crispat; flowering and fruiting entirely in summer and fall, mainly August through November; thyrses rather thick and stiff,

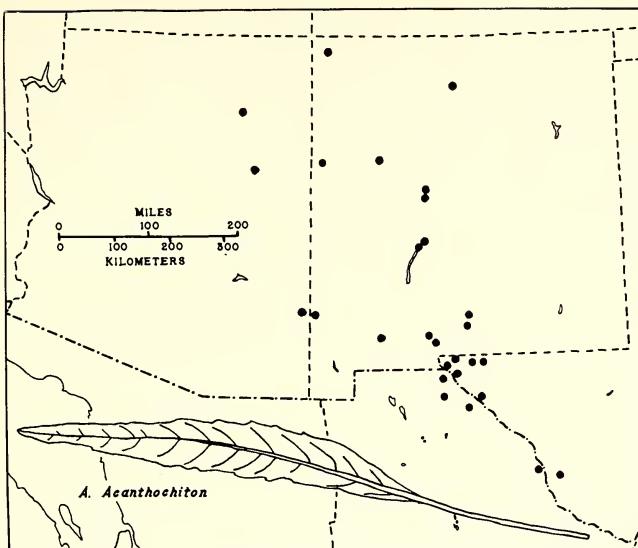


FIG. 12. *Amaranthus Acanthochiton*: distribution map.

usually less than 10 cm. long, entirely terminal on leafy branches; bracts dimorphic, those on ♂ plants with the ordinary lanceolate form common to most of the genus, 2 to 3 mm. long, with moderately heavy, excurrent midribs, those on ♀ plants 5 mm. long or more, recurved, the excurrent midribs extremely heavy, the laminae accrescent, finally enfolding the flower, indurated, with prominent reticulate venation and crenate margins; ♂ flowers with 5 stamens, 5 tepals, the inner tepals 2½ to 3½ mm. long, emarginate, the outer 3 to 4 mm. long, acute, all apiculate but dark midveins not excurrent; ♀ flowers usually with 5 tepals, the inner rudimentary, less than 1 mm. long, linear, the outer well-developed, sometimes 4 or 5 mm. long, broadly spatulate, with crenate margins and conspicuous branching venation; utricle about 2 mm. long, circumscissile, thin, somewhat rugose; style branches usually 3; seed 1 to 1¼ mm. in diameter, obovate, lenticular, dark reddish brown.

The species is at home on sand dunes, sandy riverbanks, and sandy places in general. The distribution may have been modified by Indian gathering of the plants for food. Cooked as greens, the plants have been an important food of such people as the Hopi since ancient times (Hough, 1898, p. 142).

MEXICO. CHIHUAHUA (1852). JUAREZ: *H. LeSueur* 177 TEX, 278 GH, MO, SMU, TEX, 280 GH, TEX; *C. G. Pringle* 796 CM, GH, MIN, MO, MSC, UC, US, WIS. OJINAGA: *F. Shreve* 9033 ARIZ, GH, MICH, UC. PRAXEDIS GUERRERO: *G. Thurber* 806 GH, 809 GH.

UNITED STATES. ARIZONA (1896). GREENLEE: *A. Davidson* 1081 GH. NAVAJO: *W. Hough* 60 US; *A. F. Whiting* FLAG; *M. Zuck* UC, US.

NEW MEXICO (1846). DONA ANA: *F. R. Fosberg* S3410 CAS, GH, POM, UC; *G. R. Vasey* US; *E. O. Wooton* ARIZ, COLO, NMC, OC, POM, RM, UC, US, 24 GH, MIN, MO, NMC, POM, RM, UC, US; *Wooton & Standley* 3156 IND, MIN, NMC, RM, US, WIS. HIDALGO: *E. L. Greene* 272 GH, MO, POM. LUNA: *D. Griffiths* 3330 US, 3333A US; *M. E. Jones* CAS, GH, MO, POM, RM, UC, US, UTC; *A. I. Mulford* 1030 ILL. OTERO: *F. S. Earle* 416 US; *B. Shimek* IA. MCKINLEY: *S. W. Woodhouse* GH. RIO ARRIBA: *E. O. Wooton* 2722 US. SAN JUAN: *P. C. Standley* 7887 US. SOCORRO: *C. L. Herrick* 840 US; *A. Wislizenus* 56 MO; *E. O. Wooton* NMC. VALENCIA: *E. F. Castetter* 1312 RM; *H. H. Rusby* 365½ CU.

TEXAS (1849). Indefinite locality: *C. C. Parry* MO. EL PASO: *V. L. Cory* 30990 GH; *D. B. Dunn* 8791 CAS, DUKE, MT. NMC, TENN, WIS; *V. Havard* 49 GH; *E. Stearns* 436 US; *B. C. Tharp* MICH; *B. H. Warnock* 8244 SRSC, 8245 SMU, SRSC; *E. Whitehouse* TEX. HUDSPETH: *U. T. Waterfall* 6575 GH, MO, SMU; *C. Wright* 1167 GH, US. PRESIDIO: *J. M. Bigelow* 1186 US.

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